

Programmatic HAZWOPER Health and Safety Plan

Portland Harbor Pre-Remedial Design Investigation and Baseline Sampling Portland Harbor Superfund Site

AECOM Project Number: 60554349
Geosyntec Project Number: PNG0767

March 13, 2018

Programmatic HAZWOPER Health and Safety Plan

Portland Harbor Superfund Site
Pre-Remedial Design Investigation
and Baseline Sampling

Willamette River
Portland, Oregon 97210

Prepared for:
Pre-RD AOC Group
Portland, Oregon

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Expiration Date (Max 1-Year from signature
date) March 13, 2018

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March 13, 2018

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March 13, 2018

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March 13, 2018

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



March 13, 2018

Kenneth M. Tyrrell
Project Coordinator
AECOM Technical Services

Date

HASP SUMMARY

This Health and Safety Plan (HASP) document is considered a Programmatic HASP. HASP Addendums will be prepared for each of the seven individual Field Sampling Plans (FSPs). The HASP Addendums will be appended to this Programmatic HASP once the methodology for each FSP is approved.

The purpose of the HASP Addendums and accompanying documents (e.g., Pre-Job Hazard Assessment) is to analyze the job steps and safety requirements appropriate for each methodology as described in the FSP.

Project Name:	Portland Harbor Superfund Site Pre-Remedial Design Investigation Studies	Project Number:	60554349
Summary Revision Date:	March 2, 2018	Client Name:	Portland Harbor Pre-RD AOC Group
Report ALL SH&E Incidents, no matter how minor, to the Incident Hotline: 800-348-5046 Injury, Property Damage, Vehicle, Security, Regulatory Inspection, Environmental Impact, and any potentially work related injury, discomfort/ pain, or damage.			
Identify the nearest Occupational Clinic and Hospital to the study area that accepts AECOM Workers Compensation Insurance (see Attachment A for instructions). If the nearest such clinic or hospital is an unreasonable distance from the study area, identify nearer hospitals or clinics. Attach maps and directions to the clinics and hospitals in Attachment A .			
Occupational Clinic:	Adventist Health Occupational Medicine	Nearest Hospital:	Legacy Emanuel Medical Center
Address:	10201 SE Main Street Portland, OR 97216	Address:	2801 N Gantenbein Avenue Portland, OR 97227
Phone Number:	503.408.7010	Phone Number:	503.413.2200
Key Personnel			
Project Manager:	Jennifer Pretare, Ph.D.	Cell Phone:	(b) (6)
Supervisor (Field Coordinators):	Nicky Moody (AECOM) Keith Kroeger (Geosyntec) Jennifer Pretare (AECOM)	Cell Phone:	
Safety Officer:	Nicky Moody (AECOM) Keith Kroeger (Geosyntec) Jennifer Pretare (AECOM)	Cell Phone:	
AECOM SH&E Mgr.	Fred Merrill, CSP	Cell Phone:	
Client Project Manager:	Hans Feige	Cell Phone:	
List ALL Short-Service Employees, including subcontractors (<6 Months with Company in Current Area/Job Description): All short-service employees including subcontractors will be identified in the HASP Addendums.			
List ALL Subcontractors and their Safety Officers: All Subcontractors will be identified in the HASP Addendums.			

Officers identified as of the preparation of this Programmatic HASP are listed below.

- Geosyntec: Alison Clements, 812.766.0888
- Gravity Marine: Shawn Hinz, (b) (6)
- Global Diving and Salvage: Spencer McGinnis (b) (6)
- Ballard Marine Construction: Robert Stanton, 360.695.5163
- David Evans & Associates: (will be provided with the HASP Addendum prepared for the Bathymetry Study)
- Oregon Bass and Panfish Club, a non-profit organization that may assist with catching fish for the fish tissue study and fish tracking study: (will be provided with the HASP Addendum prepared for the fish tissue study once it is confirmed whether they will participate in the study).

Project Manager (PM) must positively verify subcontractors are approved in Support for the work described. If there were any limitations/conditions of approval, describe them and how they are being met.

☒ I have verified that all subcontractors are approved in Support, and that all conditions of approval are met.

PM Name____Jennifer Pretare, Ph.D.____PM Signature  Date____3-2-2018____

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ATTACHMENTS

Attachment A: Hospital/Clinic Maps and Incident Reporting and Response Flow Chart

Attachment B: AECOM SH&E Field Applicable Procedures

Attachment C: Project and Activity Orientation Outline

Attachment D: Project/Task-Specific Pre-Job Hazard Assessments Forms

Attachment E: Daily Task Hazard Assessment/Daily Tailgate Forms

Attachment F: AED Program

Attachment G: Benzene and Vinyl Chloride Action Level Calculations

Applicable References

This Health and Safety Plan (HASP) conforms to the regulatory requirements and guidelines established in the following documents:

- Title 29, Part 1910 of the Code of Federal Regulations (29 CFR 1910), Occupational Safety and Health Standards (with special attention to Section 120, Hazardous Waste Operations and Emergency Response).
- Title 8 of the California Code of Regulations (8 CCR), with special attention to Section 5192 Hazardous Waste Operations and Emergency Response, and Section 3202, Injury Illness Prevention Program.
- 29 CFR 1926, Safety and Health Regulations for Construction.
- 8 CCR, with special attention to Sub Chapter 4, Sections 1500 - 1938 Construction Safety Orders.
- National Institute for Occupational Safety and Health/Occupational Safety and Hazards Administration/U.S. Coast Guard/U.S. Environmental Protection Agency, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, Publication No. 85-115, 1985.
- The requirements in this HASP also conform to AECOM's Safety for Life Program requirements as specified in the AECOM Safety, Health, and Environment Manual.
- The purpose of this HASP is to address health and safety concerns related to AECOM-managed activities associated with the Pre-Remedial Investigation Studies located between river mile 1.8 and 28.4 on the Willamette River in Portland, Oregon. The specific roles, responsibilities, authority, and requirements as they pertain to the safety of employees and the scope of services are discussed herein. The document is intended to identify known potential hazards and to facilitate communication and control measures to prevent injury or harm. Additionally, provisions to control the potential for environmental impact from these activities are included where applicable.

1.0 INTRODUCTION

This Programmatic HASP is designed to identify, evaluate, and control safety and health hazards and to outline emergency response actions for AECOM-managed activities on the study area. Because development of Field Sampling Plans (FSPs) for the eight individual Pre-Remedial Design Investigation (PDI) Studies is an iterative process, detailed information regarding all field activities that may or will be conducted for each study is not currently available. Preliminary identification of field activities is included for the following studies on the Pre-Job Hazard Assessment forms included in Attachment D:

- Surface sediment sampling study
- Fish tissue study
- Surface water sampling study
- Subsurface sediment sampling study
- Fish acoustic tracking study
- Sediment trap study
- Porewater metals sampling study

Preliminary identification of field activities associated with the bathymetry study (to be conducted by David Evans & Associates [DEA], a subcontractor to AECOM) and activities that will occur at the on-shore sample processing facility will be appended to this HASP as the work plans for those tasks are developed.

Because study area-specific sampling locations, methods, media, and other detailed information are to be developed for each study, safety procedures specific to that field study will be documented as an addendum to this Programmatic HASP. Each HASP Addendum will be included as an attachment to the FSP prepared for the proposed field activity. Each HASP Addendum will provide the scope of work, detailed field maps, additional study area information, hospital route maps, safety hazards and control measures, requirements for personal protective equipment, work zone delineations, and key emergency contact information. Each HASP Addendum will be prepared and followed by the subcontractor contracted to perform the specific fieldwork for the PDI Studies. At a minimum, provisions outlined in the field contractor's HASP Addendum must be consistent with those outlined in this HASP.

This HASP must be kept on-site during work activities and made available to all workers, including subcontractors and other study area occupants for informational purposes. AECOM subcontractors are expected to independently to characterize, assess, and control study area hazards created by their specific scope of work.

This section of the HASP summarizes important AECOM SH&E Procedures that apply to all Design and Consulting Services (DCS) Americas jobs. See Attachment B for complete copies of applicable field SH&E Procedures. This template has been designed primarily for use in the United States.

1.1 APPLICABLE REFERENCES

This HASP conforms to the regulatory requirements and guidelines established in the following documents:

- Title 29, Part 1910 of the Code of Federal Regulations (29 CFR 1910), Occupational Safety and Health Standards (with special attention to Section 120, Hazardous Waste Operations and Emergency Response).
- Title 8 of the California Code of Regulations (8 CCR), with special attention to Section 5192 Hazardous Waste Operations and Emergency Response, and Section 3202, Injury Illness Prevention Program.
- 29 CFR 1926, Safety and Health Regulations for Construction.

- 8 CCR, with special attention to Sub Chapter 4, Sections 1500 - 1938 Construction Safety Orders.
- National Institute for Occupational Safety and Health/Occupational Safety and Hazards Administration/U.S. Coast Guard/U.S. Environmental Protection Agency, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, Publication No. 85-115, 1985.
- The requirements in this HASP also conform to AECOM's Safety for Life Program requirements as specified in the AECOM Safety, Health and Environment (SH&E) Manual.
- The purpose of this HASP is to address health and safety concerns related to AECOM-managed activities associated with the Pre-Remedial Design Investigation Studies to be conducted between river mile (RM) 1.8 and 28.4 (the study area) on the Willamette River in Portland, Oregon. The specific roles, responsibilities, authority, and requirements as they pertain to the safety of employees and the scope of services are discussed herein. The document is intended to identify known potential hazards and to facilitate communication and control measures to prevent injury or harm. Additionally, provisions to control the potential for environmental impact from these activities are included where applicable.

1.2 PROJECT ASSUMPTIONS

- This study area is an AECOM-controlled study area.
- Study management will assist in locating subsurface utilities, vessels, and structures located on the property and outside the scope of the utility locator service.
- No confined spaces will be entered on this project.
- No excavations will be entered.
- No lone workers will participate in the field sampling activities.
- Work will be performed during daylight hours.

Work crews will work 12-hour days, 5 days a week, for 2 months (with 4 contingency days)

2.0 STUDY AREA INFORMATION AND SCOPE OF WORK

2.1 STUDY AREA DESCRIPTION

The PDI study area encompasses the in-river portion of an approximately 27-mile stretch of the Willamette River within Portland Harbor, from approximately RM 1.9 to RM28.4.

2.2 SITE BACKGROUND/HISTORY

The Site extends from RM 1.9 near the mouth of the Willamette River to RM 11.8 (Figure 1). The Willamette River is a dynamic waterbody that originates within Oregon in the Cascade Mountain Range and flows approximately 187 miles north to its confluence with the Columbia River. The study area includes a water-dependent, highly industrialized area, which contains a multitude of facilities and both private and municipal outfalls. Land use along the Lower Willamette River in the Portland Harbor includes marine terminals, manufacturing and other commercial and municipal operations, and public facilities, parks, and open spaces. The Downtown Reach, which includes the urbanized area of downtown Portland, is defined by the US Environmental Protection Agency (EPA) as extending from RM 11.8 to RM 16.6. EPA defines the Upstream Reach as extending from RM 16.6 to RM. For purposes of the PDI, the Work Plan is focusing on RM 1.9 to RM 28.4 for data collection to assess incoming contaminant loads to the Site. Collectively, the Downtown Reach and Upstream Reach are referred to as the Upriver Area for purposes of the PDI.

The shorelines along most of the Portland Harbor area have been developed for industrial, commercial, and municipal operations; the Portland Harbor area serves as a major shipping route for containerized and bulk cargo. In addition, the Portland Harbor area has historically received, and currently receives, discharges from industrial and municipal sources including point- and non-point sources that discharge to the Lower Willamette River. Common shoreline features within the harbor include constructed bulkheads, piers, wharves, buildings extending over the water, and steeply sloped banks armored with riprap or other fill materials.

On December 1, 2000, the Site was listed on the National Priorities List by EPA mainly due to concerns about contamination in the sediments and the potential risks to human health and the environment from consuming fish. The most widespread contaminants found at the Site include, but are not limited to, polychlorinated biphenyls, polycyclic aromatic hydrocarbons, dichlorodiphenyltrichloroethane and its derivatives, and dioxins/furans. A remedial investigation and feasibility study was initiated in 2001 by a small subset of potentially responsible parties known as the Lower Willamette Group and completed by EPA in 2017.

2.3 CLIENT OR THIRD-PARTY OPERATIONS AT STUDY AREA

Geosyntec (AECOM's teaming partner): Will provide on-board staff for the bathymetric study, surface sediment sampling, sediment coring, sediment traps, and porewater sampling to provide technical oversight and document the sampling process during survey activities.

Gravity Marine Services (Gravity): Will provide research vessels, equipment, and staff to conduct in-water sampling, including subsurface sediment sampling, surface sediment sampling, sediment traps porewater sampling, and fish tissue sampling, in addition to providing general research vessel support.

Global Diving and Salvage (Global Diving): Will support Gravity with a dive team for the sediment trap study.

Ballard Marine Construction (Ballard Marine): Will provide research vessels, equipment, and staff to support the fish acoustic tracking study.

HTI-Vemco: Will provide equipment and staff to support the fish acoustic tracking study.

DEA: Will provide research vessels, equipment, and staff to conduct the multi-beam bathymetry survey.

Oregon Bass and Panfish Club: Will provide angling support for the fish tissue and fish tracking study.

2.4 SCOPE OF WORK

AECOM will mobilize staff primarily from the Portland, Oregon, and Seattle, Washington, offices to conduct in-water sampling in the Willamette River. Additional AECOM technical staff will travel from other locations. PDI Studies described below:

Bathymetry Study: DEA, using DEA research vessels, will conduct a multi-beam bathymetric survey of the entire Site from RM 1.9 to 11.8 and down the Multnomah Channel to the Sauvie Island Bridge. The bathymetric survey will extend up the riverbanks to an elevation of 7.8 feet (16 NAVD88), the shoreward extent of the Site. Geosyntec will provide on-board staff to provide oversight and document the sampling process.

Surface Sediment Sampling Study: Surface (0 to 30 centimeter) sediment samples at 659 locations will be collected via a Van Veen hydraulic power grab sampler operated from two aluminum research vessels (RV Cayuse [24-foot] and RV Tieton [26-foot]) operated by Gravity, a subcontractor to AECOM. All vessel operations and sediment sampling equipment will be operated by Gravity. Gravity will be responsible for operating the following equipment:

- Research vessel (RV Cayuse and RV Tieton)
- Van Veen power grab sampler

AECOM and Geosyntec staff will provide on-board oversight, document the sampling process, and conduct on-board sample processing of surface sediment samples. On-board sample processing will involve transferring sediment samples to a tub where the sample will be homogenized using a battery-operated hand drill and paint mixer, then transferring samples to smaller containers for transport to the on-shore processing facility for further sample processing, after which they will be shipped to the lab for analysis. Additional AECOM staff will conduct on-shore processing, packaging, and shipping of the samples at AECOM's on-shore facility.

It is assumed that work crews will work 12-hour days, 5 days a week, for 2 months (with 4 contingency days). A fatigue management plan will be created if the duration of work exceeds a 14-hour day.

Fish Tissue Study: One-hundred thirty-five [135] smallmouth bass (SMB) specimens will be collected using traditional hook and line angling by an AECOM field sampling team and contract anglers belonging to the Oregon Bass and Panfish Club. The sampling will be conducted from two aluminum research vessels owned and operated by Gravity. If the required number of specimens are not collected using this method, electrofishing will be used as a back-up. Each whole-body SMB specimen (no filleting required) will be weighed, measured, photographed, and packaged for analysis at the lab. Additional AECOM staff will conduct on-shore processing, packaging, and shipping of the samples at AECOM's on-shore facility. It is assumed that sampling will take approximately 20 days (two 10-day sessions).

Surface Water Sampling Study: Surface water samples will be collected at seven transects using a PR2900 HVS coupled with an XAD cartridge and a vortex separator, owned and operated by Gravity. The sampling equipment will be operated from two aluminum research vessels (RV Mazama [24-foot] and RV Methow [26-foot]) operated by Gravity, a subcontractor to AECOM. AECOM staff will provide on-board oversight, document the sampling process, and conduct on-board sample processing of surface water samples.

Sampling events will occur during the winter and summer. It is assumed that each vessel will average one transect per day during the late fall and winter sampling events, with shorter daylight hours, for a duration of 4 days. It is assumed that each vessel will average two transects per day during the summer sampling events, with longer daylight hours, for a duration of 2 days.

Subsurface Sediment Sampling Study: Samples at 90 locations will be collected via a Vibracore System operated from at least two aluminum research vessels (RV Cayuse [24-foot] and RV Tieton [26-foot]) operated by Gravity. All vessel operations and sediment sampling equipment will be operated by Gravity. Gravity will be responsible for operating the following equipment:

- Research vessels (RV Cayuse, RV Tieton)
- Vibracore
- Sawzall, to cut the sediment cores to manageable lengths
- Power drill, to drill a small hole in the sediment core to drain excess water out

AECOM staff will provide on-board oversight and document the sampling process. Additional AECOM staff will conduct on-shore processing of the samples at AECOM's on-shore facility.

It is assumed that each vessel will average four sampling locations per day, requiring 12 days to complete the sampling and 16 days to complete the sediment core processing.

Fish Acoustic Tracking Study: A fish tracking study will be performed to characterize the movement and home range of SMB within the study area. The design will consist of a series of gates and arrays of acoustic receivers mounted on fixed moorings placed on the river bottom. The receivers will capture movement of SMB that have been implanted with acoustic tags. Ballard Marine will provide vessel support to install the receivers. HTI-Vemco will support receiver deployment and tag implantation. Fish collection will be performed using rod and reel/hook and line, with support from the Oregon Bass and Panfish Club. A total of 40 tagged SMB are targeted for collection and tagging. Surgical tag implantation will be performed by experienced HTI-Vemco field biologists with assistance from AECOM biologists at a secure on-shore location.

It is assumed that receiver deployment and fish collection/tag implant will take 2 to 3 weeks.

Sediment Trap Study: Four sediment traps will be deployed upriver of the Site during three seasonal sampling events. The traps will be deployed at the same time as surface water sampling and then retrieved after a 3-month period. Each trap will consist of four glass cylinders placed in protective PVC sleeves. Commercial divers from Global Diving will mount the cylinders vertically to rebar or a pipe anchored in the river bottom such that the tops of the cylinders are 3 feet above the mudline. At retrieval, the divers will return to the traps, cap the glass cylinders, and transfer the cylinders to the vessel for processing. Once the processing is complete, the divers will return the glass cylinders to the PVC sleeves that remain fixed to the river bed. The sediment traps will be deployed and retrieved from research vessels owned and operated by Gravity.

Geosyntec will provide on-board staff to provide oversight and document the sampling process.

It is assumed that it will take 2 days to deploy the traps and 1-2 days for sampling and removal of the traps at the end of each sampling event.

Porewater Metals Sampling Study: Geosyntec will implement the background porewater metals (arsenic and manganese) investigation work by deploying dialysis equilibrium passive porewater samplers (referred to as "peepers") in the sediment bed in areas that are representative of background metals in porewater. Peepers include a glass or polyethylene vial covered with a 0.45-micrometer polyethersulfone membrane. The interior of a peeper vial consists of rows of chambers that are filled with distilled deionized water prior to deployment. During deployment, the deionized water approaches diffusive equilibrium with the porewater, over a 2- to 4-week period; the peepers are then retrieved and the porewater is analyzed to determine concentrations of freely dissolved metals.

The peepers will be deployed using a newly developed push pole deployment system, with a marker and weighted retrieval line (thereby avoiding the need for divers). The peeper sampler is placed in an all-HDPE plastic 3-D printed frame, inserted into the sediment surface using the push pole with mounted underwater camera, and secured to the sediment bottom using sand-bag weights. The peepers will be deployed and

retrieved from research vessels owned and operated by Gravity. Geosyntec will provide on-board staff to provide oversight, operate the peeper deployment and retrieval, and document the sampling process.

It is assumed that it will take 2 days for reconnaissance to find suitable substrate conditions, 1 day for deployment, and 1 day for retrieval about 2 weeks later, plus 1 contingency day. Peepers will be deployed in the summer during low flow conditions. Ten porewater samples will be analyzed (eight plus two QA/QC), along with a co-located sediment sample for comparative metals and conventional parameters.

2.5 SCOPE OF WORK RISK ASSESSMENT

- ☐ Low Risk (examples: non-intrusive work, occasional exposure and/or low risk hazards)
- ☐ Medium Risk (examples: intrusive work, heavy equipment use, frequent exposure and/or moderate hazards)
- ☒ High Risk (examples: complicated scope, large/ multiple work crews, and/or constant exposure to hazards).

The following tasks/ hazards automatically trigger high risk ranking. Check all which apply. Include hazard mitigation procedures later in the appropriate Physical, Chemical, or Environmental section of the HASP.

<input type="checkbox"/> Asbestos removal/ contact	<input type="checkbox"/> Ordinance, Munitions, Explosives use
<input type="checkbox"/> ATV use	<input type="checkbox"/> Pile Driving
<input type="checkbox"/> Bridge/dam Inspections/ Snooper Truck use	<input type="checkbox"/> Radiation or Radioactive Instrument use
<input type="checkbox"/> Confined Space	<input type="checkbox"/> Remote location or lone worker
<input type="checkbox"/> Cranes and Rigging use	<input type="checkbox"/> Respirator use (does not include dust mask)
<input type="checkbox"/> Demolition	<input type="checkbox"/> Scaffolding use
<input checked="" type="checkbox"/> Diving- scientific or commercial	<input checked="" type="checkbox"/> Use or exposure to chemicals in excess to PEL or TLV values
<input type="checkbox"/> High speed traffic exposure	<input type="checkbox"/> Trenching/ Excavation
<input type="checkbox"/> Hot Work	<input type="checkbox"/> Tunnel/ Underground work
<input type="checkbox"/> Conditions Immediately Dangerous to Life or Health (IDLH)	<input type="checkbox"/> UXO/ MMR
<input type="checkbox"/> Laboratory Operations	<input type="checkbox"/> Work at Heights > 4ft.
<input type="checkbox"/> LOTO or Live Energy Source work	<input type="checkbox"/> Work at angle >30 deg.
<input type="checkbox"/> On-rail/ Near Rail work	<input checked="" type="checkbox"/> Work On/Over Water

3.0 AECOM SAFETY, HEALTH, AND ENVIRONMENT PROGRAM

3.1 AECOM POLICY

Safety, Health and Environment Policy Statement



Purpose
This policy establishes the framework to attain best-in-class Safety, Health and Environmental (SH&E) performance for AECOM's employees in the global marketplace.

Commitment
AECOM is committed to exceptional levels of performance in protecting its people and the environment. As stated in our Core Values, keeping our people safe is our most important measure of success. We strive to be the beacon of safety excellence in the industries and global communities in which we work.

To advance our SH&E program, we are committed to:

- Zero work-related injuries to AECOM employees and protection of the environment as a result of our activities.
- Providing a highly effective SH&E management system that drives continual review and improvement.
- Meeting client requirements and properly incorporating all safety, health and environmental rules and regulations at the local, state, provincial and national levels.
- Developing an exceptional safety culture where our people embrace ownership for the safety of themselves and others.
- Substantial improvements toward our goals of pollution prevention, resource conservation and environmental sustainability.
- Setting and meeting aggressive SH&E performance goals and Core Value Metrics to promote continuous improvement.
- Working with employees and business partners in order to continuously improve SH&E performance.
- Recognizing and celebrating those who contribute to excellent SH&E performance.
- Striving to make AECOM the provider of choice for the safe execution of design, build, finance, operate and maintenance work globally.

The commitment to this policy by the leadership, management and employees of AECOM provides the foundation for a safe workplace, operational excellence and long-term business success.

Expectations
Safety is a core value and a key to our success. We demand continuous improvement in our journey toward a zero incident culture, where everyone is committed to safety, health and environmental excellence.

To that end, we demand:

- Our leaders, managers, supervisors and employees demonstrate their commitment in their actions and decisions to assure that every person goes home safe every day.
- Our employees embrace safety as a core value both on and off the job.
- Each employee is committed to his/her own safety and that of his/her fellow employees.
- We will incorporate Life-Preserving Principles into our work planning and execution.
- We proactively and aggressively identify, manage and eliminate hazards in the workplace.
- We train and prepare our people to have the knowledge, skills, competency and equipment required to work safely.
- We stop our employees from working if the work cannot be executed safely or if conditions or behaviors on the work activity are unsafe.
- All employees immediately report safety, health and/or environmental incidents, near-misses, unsafe conditions, and at-risk behaviors to their supervisor; and that we diligently work to correct the problem.

Our SH&E expectations will be accomplished by the demonstrated leadership of management, compliance with regulatory requirements and participation of AECOM personnel.

Communication
This Policy will be reviewed annually to ensure it meets the needs of the company, and will be made available to all persons under the control of the company.

Sincerely:



04 March 2016
Date

Michael S. Burke
Chairman and Chief Executive Officer

3.2 SAFETY FOR LIFE



"Safety for Life" is a comprehensive integrated AECOM Safety Management System that drives our nearly 100,000 employees toward AECOM's commitment to achieving zero work-related injuries and/or illnesses; preventing damage to property and the environment; and maintaining an environmentally friendly and sustainable workplace. Our Safety for Life program is supported by nine Life Preserving Principles that apply to all AECOM activities.

3.3 LIFE PRESERVING PRINCIPLES

Demonstrated Management Commitment

Our Executive, senior and project managers will lead the SH&E improvement process and continuously demonstrate support and commitment.

Employee Participation

Our employees will be encouraged and empowered to become actively engaged in our safety processes through their active participation in safety committees, training, audits, observations and inspections. Employees will be encouraged to participate in health initiatives and adopt a healthy lifestyle.

Budgeting and Staffing for Safety

Our safety staff will be competent, fully trained and qualified to provide technical resources to our internal and external clients. A budget to support safety activities will be included in project proposals.

Pre-Planning

Our design, engineering, project and construction management staff will deploy effective risk mitigation efforts to design, plan and build safety into every project. Pre-Project and Pre-Task planning will be an effective tool in protecting our employees and the environment.

Contractor Management

Our project staff will work closely with our sub-consultants, subcontractors, contractors and Joint Venture Partners to provide a safe work environment for employees and members of the public. Our goal of SH&E performance excellence will be equally shared by all project participants.

Recognition and Rewards

Our employees will be recognized for their efforts in working safely and their support of our safety efforts.

Safety Orientation and Training

Our employees will be provided with effective safety training in order to identify and mitigate hazards in the workplace to prevent injuries to themselves and others who may be affected by their actions.

Incident Investigation

Our managers and safety professionals will investigate all recordable incidents and serious near misses to identify contributing factors and root causes in order to prevent a reoccurrence. Lessons learned shall be identified, communicated and implemented.

Fit for Duty

Our employees are responsible to report to work each day fit for duty and not to pose a health and safety hazard to themselves or others.

3.4 DRIVING AND VEHICLE SAFETY

The proper operation of vehicles is critical to protecting the safety of AECOM employees and subcontractors. Drivers face numerous hazards while operating vehicles. Some of the hazards include collision with another vehicle, collision with a fixed object, vehicle break down or failure, or falling asleep or becoming otherwise incapacitated while driving. All employees will adhere to Driving procedure [S3AM-005-PR](#), which includes the following key practices:

- **Authorized Drivers** - Managers must authorize drivers following evaluation of driver criteria to drive and maintain an AECOM-owned, leased or rented vehicle, a client or customer-owned vehicle, or a personal vehicle operated in the course of conducting AECOM business.
- **Electronic Devices Prohibited** - AECOM prohibits use of all portable electronic devices while operating a motor vehicle/ equipment, which includes being stopped at a traffic light or stop sign. This includes cell phones, two-way radios, and other items whether hand-held or hands-free. Electronic devices include, but are not limited to, all mobile phones, pagers, iPods, MP3s, GPS, DVD players, tablets, laptops, and other portable electronic devices that can cause driver distraction. Hands-free device use is not allowed.

- GPS units and devices used for navigation may only be used if factory installed or secured to the vehicle with a bracket that allows the driver to view the image without having to take their eyes off the road. Electronic devices shall be setup for operation prior to commencing driving activities and shall not be changed by the driver while driving.
- **Vehicle Inspections** - The driver shall conduct pre-trip vehicle inspections prior to each trip. A vehicle inspection checklist, [S3AM-005 FM2](#), can be used to guide and document the inspection process. Vehicle inspection is to include a 360-degree walk around and visual inspection under the vehicle for leaks and obstructions prior to moving the vehicle.
- **Training** - All drivers shall complete defensive driver training. Additional training (i.e., hands-on defensive driver training) may apply for medium and high-risk drivers; see Driving procedure [S3AM-005-PR](#) and SHE Training procedure [S3AM-003-PR](#) for more details.
- **Journey Management Plan** - Drivers who undertake trips in excess of 250 miles (400 kilometers) one way, drive in remote or hazardous areas, or when otherwise deemed necessary, shall develop and document a Journey Management Plan using [S3AM-005-FM1](#) or equivalent.
- **Secure Loads** - Cargo is only to be carried within the passenger compartment of a vehicle when segregated and restrained to prevent objects from becoming distractions, obstructions, or projectiles to occupants should emergency vehicle maneuvers be required (e.g., harsh braking or crash). All goods transported on flatbed trucks or in pickup beds must be securely fastened to prevent them from becoming hazards. All applicable laws and regulations regarding securing of loads must be met. It is prudent to check the load after a few miles to ensure that load has not shifted or loosened prior to completing the remainder of the trip.
- **Backing Up** - Reversing the vehicle is to be avoided if possible. If backing up is necessary, use the following guidelines:
 - Use a spotter at all times when backing a vehicle.
 - Pre-plan all vehicle movements.
 - If the pull-through method of parking is not possible, drivers will scan parking spot/area for hazards and back in; thereby, facilitating departure where the first move is forward.
 - A light tap of the horn should be used to alert others of your intention to back up.
 - Avoid tight spaces.
 - Vehicles over 10,000 pounds gross vehicular weight are required to have a competent spotter in place when backing. A competent spotter is one that has received spotter training.
 - All vehicles shall have a competent spotter in place when backing in an active work zone. Parking and public access areas are recommended but not required to have a spotter.

3.5 FITNESS FOR DUTY

One of AECOM's nine Life-Preserving Principles is Fitness for Duty (see Fitness for Duty procedure [S3AM-008-PR](#)). Fitness for Duty means that individuals are in a state (physical, mental, and emotional) that enables them to perform assignments competently and in a manner that does not threaten the health and safety of themselves or others. On certain projects or for specific tasks, fit for duty certifications may be requested of medical providers by SH&E Managers or Human Resources (HR). Employees should report to work fit for duty and unimpaired by substances or fatigue. Supervisors must observe their employees and work with the employee, SH&E staff, and HR to address deficiencies. AECOM will not tolerate retaliation against any employee for filing a complaint or concern regarding their fitness for duty or participating in any way in an investigation.

3.5.1 Medical Surveillance

AECOM's [S3AM-128-PR, Medical Screening and Surveillance](#), details the requirements to participate in a medical monitoring program. Medical Surveillance provides a streamlined process to determine if employees meet the physical requirements to perform assigned duties as defined by applicable regulations. It is also designed to provide a means to collect data relevant to exposure to chemical and physical agents for the protection of the workers and to confirm the effectiveness of health and safety programs.

3.5.2 Fatigue

One aspect of fit for duty is fatigue management. AECOM has developed procedures that limit work periods or require additional rest under certain circumstances, including during long-distance travel or when working at high altitudes. These procedures also set limits on extended work periods of 14 hours per day or 60 hours per week. A fatigue management plan is required if longer working hours are necessary (see Fatigue Management Procedure [S3AM-009-PR](#)).

3.5.3 Substance Abuse

Drug and alcohol abuse pose a serious threat to the health and safety of employees, clients, and the general public as well as the security of our job sites, equipment, and facilities. AECOM is committed to the elimination of illegal drug use and alcohol abuse in its workplace and regards any misuse of drugs or alcohol by employees to be unacceptable. AECOM Substance Abuse Prevention Procedure ([S3AM-019-PR](#)) prohibits the use, possession, presence in the body, manufacture, concealment, transportation, promotion, or sale of the following items or substances on company premises. Company premises refer to all property, offices, facilities, land, buildings, structures, fixtures, installations, aircraft, automobiles, vessels, trucks and all other vehicles and equipment - whether owned, leased, or used.

- Illegal drugs (or their metabolites), designer and synthetic drugs, mood or mind-altering substances, and drug use related paraphernalia unless authorized for administering currently prescribed medication;
- Controlled substances that are not used in accordance with physician instructions or non-prescribed controlled substances; and
- Alcoholic beverages while at work or while on any customer- or AECOM-controlled property.

This policy does not prohibit lawful use and possession of current medication prescribed in the employee's name or over-the-counter medications. Employees must consult with their health care provider about any prescribed medication's effect on their ability to perform work safely and disclose any restrictions to their supervisor.

Although some states may pass laws legalizing medical or recreational marijuana use, the use, sale, distribution, and possession of marijuana are violations of federal law and AECOM policy and will subject an employee to disciplinary action up to and including termination in accordance with controlling law.

3.6 HAND SAFETY

The hands are exposed to hazards more than any body part. SH&E Hand Safety Procedure [S3AM-317-PR](#) describes requirements and best practices including these notable practices:

- **All personnel shall have gloves in their immediate possession 100%** of the time when in a shop or on a work location. Gloves that address the hazard shall be worn when employees work with or near any materials or equipment that present the potential for hand injury due to sharp edges, corrosives, flammable and irritating materials, extreme temperatures, splinters, etc. Use the Gloves Needs Assessment ([S3AM-317-FM1](#)) to help determine the appropriate glove for the hazard(s).

- **Fixed open-blade knives are prohibited** from use during AECOM work. Examples of fixed open-blade knives include pocket knives, multi-tools, hunting knives, and standard utility knives. For more information about cutting tools, see [S3AM-317-ATT1](#), Safe Alternative Tools.

3.7 HAZARD COMMUNICATION

Hazardous materials that may be encountered as existing environmental or physical/health contaminants are listed in Section 8.1, Potential Chemical Hazards, and will be further addressed in the HASP Addendums that will be appended to this Programmatic HASP. Their properties, hazards, and associated required controls will be communicated to all affected staff and subcontractors in accordance with the requirements of AECOM Procedure [S3AM-115-PR1](#) Hazardous Materials Communication including these key elements:

- All personnel shall be briefed on the hazards of any chemical product they use and shall be aware of and have access to the Safety Data Sheets (SDS).
- All containers shall be properly labeled to indicate their contents. Labeling on any containers not intended for single-day, individual use shall contain additional information indicating potential health and safety hazards (flammability, reactivity, etc.).

In addition, any employee or organization (contractor or subcontractor) intending to bring any hazardous material onto this AECOM-controlled study area must first provide a copy of the item's SDS to the Supervisor or Safety Officer for review and filing. The Supervisor or Safety Officer will maintain copies of all SDS on-site and in Project- Specific HASPs appended to this HASP. SDS may not be available for locally obtained products, in which case an alternate form of product hazard documentation will be acceptable.

3.8 HAZARDOUS MATERIAL HANDLING AND WASTE MANAGEMENT

If hazardous, solid, and/or municipal wastes are generated during any phase of the project, the waste shall be accumulated, labeled, and disposed of in accordance with applicable Federal, State, Provincial, Territorial and/or local regulations and SH&E Procedure [S3AM-116-PR](#), Hazardous Materials Shipping. A project-specific Entity Letter may be required for the project/client; if so, only persons named on the entity letter are allowed to sign waste shipping papers "**on behalf of [Pre-RD AOC Group]**." Any individual signing shipping papers must have valid Department of Transportation and Resource Conservation and Recovery Act (RCRA) training for waste shipment. Consult the [HZM/HZW & TDG page](#) on Ecosystem or the SH&E Manager for further guidance on AECOM and regulatory procedures and training requirements.

3.9 HOUSEKEEPING AND PERSONAL HYGIENE

Basic housekeeping requirements for offices and work areas, as well as personal hygiene and sanitation standards, can be found in S3AM-013-PR, Housekeeping. Inspections should be performed at the regular interval specified below. The housekeeping inspection form S3AM-013-FM1 is available for use.

Complete the table below regarding project-specific Housekeeping and Personal Hygiene requirements:

Housekeeping: Inspection Frequency: twice a day	Inspector: Designated Safety Officer for individual study (to be designated in HASP Addendums)
Eating, Drinking, Smoking: Eating and drinking of non-alcoholic beverages permitted on research vessels in areas designated by the vessel operator. No smoking or alcoholic beverages allowed on research vessels.	

<p>Handwashing: Water, soap, and paper towels or equivalent supplies are located TBD.</p> <p>Project staff will wash hands and face after completing work activities and prior to breaks or meals.</p>
<p>Toilets: Some of Gravity's research vessels have toilets. Public restrooms and shower facilities are also available at the Swan Island boat launch.</p>
<p>Water: Bottled water will be provided by AECOM, Geosyntec, or subcontractor Field Coordinators aboard vessels.</p> <p>A water supply meeting the following requirements will be utilized:</p> <p><i>Potable Water</i> - An adequate supply of potable water will be available for field personnel consumption. Potable water can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Disposable drinking cups for single use and a waste receptacle will be provided as needed. Water containers will be refilled daily and disinfected regularly. Potable water containers will be properly identified in order to distinguish them from non-potable watersources.</p> <p><i>Non-Potable Water</i> - Non-potable water may be used for hand washing and cleaning activities. Non-potable water will not be used for drinking purposes. All containers of non-potable water will be marked with a label stating "Non-Potable Water, Not Intended for Drinking Water Consumption"</p>
<p>Illumination will be provided in the form of natural light.</p>

3.10 LONE WORKER

No lone workers will participate in the field sampling tasks for this project. AECOM discourages employees from working alone (i.e., where AECOM personnel are out of visual and audio range of others) when performing field tasks. Lone workers may conduct activities at the onshore sample processing facility when other employees are not present. Any employee working alone at the onshore processing facility will complete a Task Hazard Assessment (THA) prior to starting work each morning, and will adhere to AECOM's lone worker policies and procedures (see SH&E Procedure [S3AM-314-PR, Working Alone](#)).

3.11 SAFETY OBSERVATIONS

Safety observations are observations made by employees and subcontractors of a condition or behavior that could contribute to an incident, prior to the incident occurring. Observations can also identify positive behaviors or interventions which contribute to the prevention of incidents. Large, long-term projects may benefit from the use of LifeGuard to track and trend observations on a program level. All other projects should log their observations using IndustrySafe. Both reporting systems can be accessed on any safety page of ecosystem, or the QR codes below can be used while off the AECOM network from a smartphone/device.



3.12 SHORT SERVICE EMPLOYEE

A Short Service Employee is an employee with fewer than 6 months experience working on field projects or an employee who has not completed the required training or received required certifications (see the Short Service Employee procedure, [S3AM-002-PR](#)). The Project Manager will identify all Short Service Employees working on the project, and each Short Service Employee will be assigned to an experienced team member so all activities may be monitored. Short Service Employees shall be easily identified in the field environment, such as by wearing a specific-colored hardhat or applying a manufacturer-approved orange stripe to their hardhat, or be clearly identified by some other system. Any new employee shall wear the designated Short Service Employee identifier until the Project Manager determines the employee has the knowledge, skills, and ability related to the specific hazard on the project.

3.13 STOP WORK AUTHORITY

AECOM empowers and expects all employees to exercise their Stop Work Authority (see Stop Work Authority Procedure [S3AM-002-PR](#)) if an incident appears imminent, or when hazardous behaviors or conditions are observed. A stop work request can be informal if the situation can be easily corrected, or may require shutting down operations if revised procedures are necessary to mitigate the hazard. If an AECOM employee observes an imminently hazardous situation on a study area controlled by others (i.e., a client-managed contractor), the employee can always stop work for themselves by removing themselves from the situation.

Employees also may attempt to stop work to avoid allowing the contractor to come to harm by immediately notifying the contractor foreman or project engineer, or if necessary, the client or party managing the contractor.

No employee should object to the issuance of a stop-work request, nor can any disciplinary action be levied against the employee. All employees must agree that the situation has been mitigated before resuming work. No employee will be disciplined for refusing to work if they feel it is unsafe.



3.14 COLD WEATHER AND COLD WATER CONDITIONS FOR ON-WATER WORK

The majority of this program will occur on research vessels over water, during all times of the year. Because of the unique conditions that may be encountered in the study area and the physical nature of the work, a summary is provided here for the use of personal flotation devices (PFDs) and thermal protection under a variety of water and air temperature regimes. Additional information is provided in AECOM SH&E Procedure [S2NA-112-Cold Stress](#) and [S2NA-315-Working on and Near Water](#) in Attachment B.

3.14.1 Cold Stress Prevention Plan:

Cold weather conditions are considered those conditions below a Wind Chill Temperature of 50 degrees Fahrenheit (10 degrees Celsius). Working in a marine environment increases hypothermic risk due to the moisture content in the air. Recognizing the increased risk for exposure to hypothermia in cold weather conditions, the project will establish the following minimum working temperature thresholds:

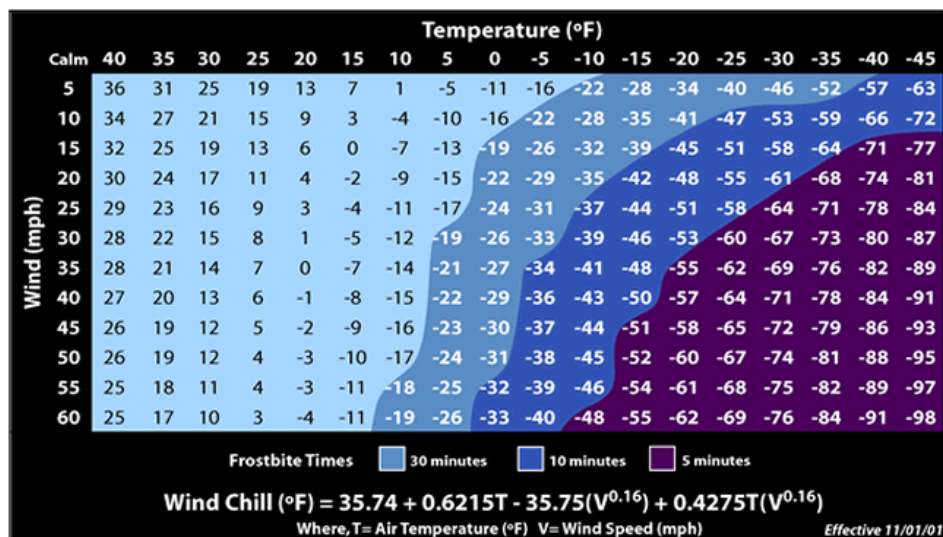
		Air Temperature (including wind chill)		
		>50°F	50°F to 40 °F	<40 °F
Water Temperature	>50°F	USCG Type III PFD.	USCG Type III PFD.	Stop Work
	50°F to 45 °F	USCG Type III PFD.	Mustang survival suit	Stop Work
	44°F to 40 °F	Mustang survival suit	Mustang survival suit	Stop Work
	< 40 °F	Stop Work	Stop Work	Stop Work

Notes:

- Assumes AECOM staff or subcontractors are not exposed to significant potential of falling into water. Significant potential of falling into water can be defined as placing one's body beyond the life line or outer boat railing while performing job duties. Boarding/off boarding at the dock is not included in this definition and assumes all boarding/off-boarding is performed after the vessel has been secured at the dock.
- Assumes rescue of man-over-board (MOB) can be performed within 3 minutes.
- Assumes no ice or snow conditions are occurring or are forecasted to occur during the days of on-water work.
- Stop Work occurs when the water or air temperature (including effects of wind chill) are below the 40 degrees Fahrenheit threshold. Work will resume after the temperature threshold is met or exceeded.
- For air temperatures below 50 degrees Fahrenheit, personnel should dress in layers and shall not use cotton as base layer as it reduces insulation capabilities when wet. All personnel shall have a set of dry clothing.
- The Wind Chill Chart Below can be used to determine the effects of wind speed on temperature. Additional information is contained within Attachment B, AECOM SH&E Procedure S2NA-112-Cold Stress.



Wind Chill Chart



Additional Training

Employees and subcontractors who will be exposed to cold weather conditions will watch a training video on the physiological effects of cold water immersion found at: <http://www.coldwaterbootcamp.com>. Training completion will be documented prior to the commencement of the field activities and will be stored in the project files.

A MOB drill will be performed at the commencement of water work activities to assess MOB recovery activities.

Additional Personal Protective Equipment (PPE)

PPE that will be worn during cold weather conditions below 50 degrees F include but are not limited to the following:

- Three layers of non-cotton clothing; examples include down, wool, or other synthetic materials to provide insulation when wet
- Outer layer to break the wind
- Hat or hardhat liner
- Insulated footwear
- Gloves that allow for insulation and dexterity; hand warmers will also be provided

4.0 ROLES AND RESPONSIBILITIES

Roles and responsibilities for the project team are defined in SH&E Procedure [S3AM-209-PR](#), Safe Work Standards and Rules. The Project Manager is ultimately responsible for the development of this HASP and establishing a budget to implement the controls and training required. The PM is also responsible for ensuring that the plan is implemented, that appropriate documentation is generated, and that records are maintained. The SH&E Manager is responsible for reviewing and approving this HASP and assisting with other SH&E matters upon request. A Safety Officer may be appointed to oversee implementation of the HASP in the field. All project team members are responsible for reviewing and abiding by this HASP, performing daily (or more frequent) THAs, stopping work when necessary to correct unsafe behaviors or conditions, and reporting incidents promptly to the Project Manager and AECOM Incident Reporting Hotline (Incident Hotline 800-348- 5046).

4.1 SH&E MANAGER AND SAFETY OFFICER: FRED MERRILL, CSP

Mr. Merrill is the Safety, Health and Environment (SH&E) Area Manager for the Pacific Northwest of the AECOM Design and Consulting Services – Americas. He is a Certified Safety Professional (CSP #30431) serving approximately 400 employees, spanning five states (Alaska, Washington, Oregon, Idaho, and Montana). Mr. Merrill works as part of an integrated AECOM SH&E team to assist and collaborate with AECOM senior management in maintaining and improving AECOM's robust SH&E culture and to minimize operational losses, occupational health problems, accidents, and injuries. Mr. Merrill also maintains the following trainings and certifications:

- Safety Trained Supervisor Construction (Board of Certified Safety Professionals STSC)
- Occupational Safety and Health Administration (OSHA) 30-Construction Safety and Health
- 40-hour OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) Training
- 8-hour OSHA HAZWOPER Refresher Training
- 8-hour OSHA HAZWOPER On-Site Manager/Supervisor Training
- Community Emergency Response Team (CERT) Training

Mr. Merrill will serve as the program's Safety Officer. In this role, his essential duty is to review tasks associated with individual studies and assign a qualified Safety Supervisor.

The Safety Officer supports the Supervisor in providing a safe work environment. Not all studies will have a designated Safety Officer; the decision should be made by the Project Manager and SH&E Manager, taking into consideration the complexity and risks of the scope of work. The Supervisor may act as the Safety Officer on sites without one. The Safety Officer's responsibilities include the following:

- Approve the type (full time, collateral duty, alternates) and qualifications (training and years of experience) of Safety Supervisors per the requirements of each task.
- Updating the study area-specific HASP to reflect changes in conditions or the scope of work. HASP updates must be reviewed and approved by the SH&E Manager.
- Inspecting the study area for compliance with this HASP and the SH&E Procedures using the appropriate field audit inspection checklist found in IndustrySafe.
- Coordinating with the Supervisor to review JSAs and THAs with the work crew.

- Assisting as needed to report incidents and verify that incidents and observations are logged into Lifeguard or IndustrySafe.
- Working with the Supervisor and Project Manager to develop and implement corrective action plans to correct deficiencies discovered during Site inspections. Deficiencies will be discussed with project management to determine appropriate corrective action(s).
- Contacting the SH&E Manager for technical advice regarding safety issues.
- Determining emergency evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation.
- Checking that all personnel and visitors have received the proper training, orientation, and medical clearance prior to entering the study area.
- Establishing controlled work areas (as designated in this HASP or other safety documentation).
- Facilitating or co-leading daily tailgate meetings and maintaining attendance logs and records.
- Discussing potential SH&E hazards with the Site Supervisor, the SH&E Manager, and the Project Manager.
- Selecting an alternate Safety Officer by name and informing him/her of their duties, in the event that the Safety Officer must leave or is absent from the study area.
- Verifying that all operations are in compliance with the requirements of this HASP.
- Issuing a "Stop Work Order" under the conditions set forth in this HASP.
- Temporarily suspending individuals from field activities for infractions against the HASP pending consideration by the SH&E Manager and the Project Manager.

4.2 PROJECT MANAGER: JENNIFER PRETARE

The Project Manager has overall management authority and responsibility for all study area operations, including safety. The Project Manager will provide the Supervisor with work plans, staff, and budgetary resources, which are appropriate to meet the safety needs of the project operations. Some of the Project Manager's specific responsibilities include the following:

- Verifying that personnel to whom this HASP applies, including AECOM subcontractors, have received a copy of it, with ample opportunity to review the document and to ask questions.
- Providing the concurring SH&E Manager with updated information regarding conditions at the study area and the scope of study area work if changes occur that will affect the accuracy of this HASP.
- Providing adequate authority and resources to the Supervisor or Safety Officer to allow for the successful implementation of all necessary SH&E Procedures.
- Maintaining regular communications with the Supervisor or Safety Officer and, when necessary, the AECOM Client SH&E Program Manager.
- Coordinating the activities of AECOM subcontractors and ensuring that they are aware of the pertinent health and safety requirements for these projects, when applicable.

- Conducting Safety System Auditing by way of Management Visits and/or Project Manager Self Assessments on a regular basis.
- Approving amendments to the HASP (in conjunction with the Supervisor or Safety Officer).
- Coordinating activities with the client as needed to ensure the safe implementation of this HASP.

4.3 SAFETY SUPERVISOR (FIELD COORDINATORS): NICKY MOODY, KEITH KROEGER, JENNIFER PRETARE

The Safety Supervisor (Field Coordinator) has the overall responsibility and authority to direct work operations at the job site according to the provided work plans and HASP. The three primary Safety Supervisors are anticipated to be Nicky Moody, Keith Kroeger, and Jennifer Pretare. Additional Safety Supervisors may be designated by Fred Merrill as needed, based on evaluation of the study tasks and qualifications of personnel. The Project Manager may act as the Safety Supervisor while on-site. The Safety Supervisor's responsibilities include the following:

- Discussing deviations or drift from the work plan with the Safety Officer and Project Manager.
- Discussing safety issues with the Project Manager, Safety Officer, and field personnel.
- Assisting the Safety Officer with the development and implementation of corrective actions for study area safety deficiencies.
- Assisting the Safety Officer with the implementation of this HASP and ensuring compliance.
- Assisting the Safety Officer with inspections of the study area for compliance with this HASP and applicable SH&E Procedures.
- Reviewing Job Safety Analyses (JSAs) and THAs with the work crew.
- Reporting incidents and ensuring incidents and observations are logged into Lifeguard or IndustrySafe.
- Verifying that all operations are in compliance with the requirements of this HASP and halting any activity that poses a potential hazard to personnel, property, or the environment.
- Temporarily suspending individuals from field activities for infractions against the HASP pending consideration by the Safety Officer, the SH&E Manager, and the Project Manager.

4.4 EMPLOYEES

Responsibilities of employees associated with this project include, but are not limited to:

- Understanding and abiding by the SH&E Procedures specified in the HASP and other applicable safety policies and clarifying those areas where understanding is incomplete.
- Providing feedback to SH&E management for continuous improvement relating to omissions and modifications in the HASP or other safety policies and procedures.
- Notifying the Supervisor or Safety Officer of unsafe conditions and acts.
- Stopping work if there is doubt about how to safely perform a task or if unsafe acts or conditions are observed (including subcontractors or team contractors).

- Speaking up and refusing to work on any study or operation where the SH&E procedures specified in this HASP or other safety policies are not being followed.
- Contacting the Safety Supervisor or Safety Officer or the SH&E Manager at any time to discuss potential concerns.

4.5 SUBCONTRACTORS

The requirements for subcontractor selection and subcontractor safety responsibilities are outlined in AECOM Procedure [S3AM-213-PR](#), Subcontractor Management. Each AECOM subcontractor is responsible for assigning specific work tasks to their employees. Each subcontractor's management will provide qualified employees and allocate sufficient time, materials, and equipment to safely complete assigned tasks. In particular, each subcontractor is responsible for equipping its personnel with any required personnel protective equipment (PPE) and all required training.

AECOM considers each subcontractor to be an expert in all aspects of the work operations for which they are tasked to provide, and each subcontractor is responsible for compliance with the regulatory requirements that pertain to those services as well as all other requirements applicable to their work. Each subcontractor is expected to perform its operations in accordance with its own unique safety policies and procedures, to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to AECOM for review prior to the start of on-site activities.

Hazards not listed in this HASP but known to any subcontractor, or known to be associated with a subcontractor's services, must be identified and addressed to the AECOM Project Manager or the Supervisor prior to beginning work operations. The Supervisor or authorized representative has the authority to halt any subcontractor operations, and to remove any subcontractor or subcontractor employee from the study area for failure to comply with established health and safety procedures or for operating in an unsafe manner.

AECOM will have the following subcontractors on-site. Each subcontractor will prepare a HASP addressing the field activities for which they are responsible and will submit these to AECOM for review. Subcontractor HASPs will be appended to this Programmatic HASP.

Geosyntec (AECOM's teaming partner): Will provide on-board staff for the bathymetric study, surface sediment sampling, sediment coring, sediment traps, and porewater sampling to provide oversight and document the sampling process during survey activities.

Gravity: Will provide research vessels, equipment, and staff, including dive crew, to conduct in-water sampling, including subsurface sediment sampling, surface sediment sampling, sediment traps and porewater sampling, and fish tissue sampling, in addition to providing general research vessel support.

Global Diving: Will support Gravity with a dive team for a sediment trap study.

Ballard Marine: Will provide research vessels, equipment, and staff to support the fish acoustic tracking study.

HTI-Vemco: Will provide equipment and staff to support the fish acoustic tracking study.

DEA: Will provide research vessels, equipment, and staff to conduct a multi-beam bathymetry survey.

Oregon Bass and Panfish Club: May provide support for catching fish for the (SMB tissue sampling study).

4.6 VISITORS

Authorized visitors (e.g., client representatives, regulators, AECOM management staff, etc.) requiring entry to any work location on the study area will be briefed by the Project Manager, Supervisor, or Safety Officer on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for compliance with their employer's health and safety policies. In addition, this HASP specifies the minimum acceptable qualifications, training, and PPE that are required for entry to any controlled work area; visitors must comply with these requirements at all times.

If the visitor requires entry to any exclusion zone (EZ), but does not comply with the above requirements, all work activities within the EZ must be suspended.

Unauthorized visitors, and visitors not meeting the specified qualifications, will not be permitted within established controlled work areas.

5.0 TRAINING AND DOCUMENTATION

The following sections describe the standard practices or programs that AECOM will establish to prepare employees to perform work safely and consistent with AECOM policy and procedures.

5.1 HASP/SITE ORIENTATION

The Project Manager shall conduct a Project/Site-specific HASP orientation prior to the start of field operations, with support as needed by the SH&E Manager, Safety Officer, or Supervisor. This meeting will involve representatives from all organizations with a direct contractual relationship with AECOM on the job site. Minimum items to be covered are listed in **Attachment C**. Participants will then sign the HASP Personnel Acknowledgement register at the end of the HASP.

5.2 DAILY TAILGATE MEETINGS AND TASK HAZARD ASSESSMENT REVIEW

The Supervisor, Safety Officer, or designee shall facilitate a tailgate meeting to discuss the specific requirements of this HASP, review the applicable JSAs, and/or complete THAs prior to the commencement of daily project activities. Attendance at the daily tailgate meeting is mandatory for all employees and subcontractors at the Site contracted to AECOM. Simultaneous operations are encouraged to attend each other's tailgate meetings or at the very least the supervisors shall discuss the coordination of activities and associated hazards of each other's tasks. The supervisor will then convey the information to the work crew. The Tailgate Meeting must be documented by the Supervisor or Safety Officer on a Daily Tailgate Meeting form, a blank copy of which is included in **Attachment E**.

5.3 WORKER TRAINING AND QUALIFICATIONS

All personnel at this study must be qualified and experienced in the tasks they are assigned. SH&E Training Procedure [S3AM-003-PR](#) establishes the general training requirements for AECOM employees. In addition, [S3AM-117-PR, Hazardous Waste Operations](#), explains the HAZWOPER training, and [S3AM-128-PR, Medical Screening and Surveillance](#), details the medical surveillance requirements.

Check all required training on the table below. Verify training records of employees and subcontractors.

Table 5.1.1 Site-Specific Training Requirements

HAZWOPER Activities			
Activity	Medical Surveillance	Training	Applies to
Sediment trap collection/sampling Surface sediment collection/sampling Subsurface sediment collection/sampling All sediment handling in processing laboratory Porewater collection/sampling	Yes	HASP Orientation	All Employees and Subcontractors
		Boat Safety Orientation	All Employees and Subcontractors performing project work on a vessel
		HAZWOPER 40-hour	All Employees and Subcontractors working in the exclusion and contamination reduction zones
		HAZWOPER 8-hour refresher	All Employees and Subcontractors working in the exclusion and contamination reduction zones
		HAZWOPER Supervisor	Employees managing others in HAZWOPER activities
		Fit Test/ Respiratory Protection	Employees needing to wear respirators
		Hazardous Materials Shipping	Employee responsible for shipping HZM/HZW/DG and/or signing
		Man-overboard Training	All Employees and Subcontractors performing project work on a vessel
		Cold weather training	All Employees and Subcontractors performing project work in cold work environments
		Fatigue Management	All Employees and Subcontractors
Non-HAZWOPER Activities			
Activity	Medical Surveillance	Training	Applies to
Fish Tracking Fish Tissue Sampling Bathymetric Survey	No	HASP Orientation	All Employees and Subcontractors
		Boat Safety Orientation	All Employees and Subcontractors performing project work on a vessel
		Man-overboard Training	All Employees and Subcontractors performing project work on a vessel
		Cold weather training	All Employees and Subcontractors performing project work in cold work environments
		Fatigue Management	All Employees and Subcontractors

5.3.1 Competent Person

A competent person is an employee who, through education, training, and experience, has knowledge of applicable regulatory requirements, is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

AECOM's Competent Person Designation Procedure, S3AM-202-PR, explains the roles, responsibilities and procedures of naming a competent person. Complete the table below and include a S3AM-202-FM1 Competent Person Designation Form for each AECOM competent person (subcontractors to use an equivalent process).

These activities require a competent person. Mark all that apply and list the name of the person.

	Activity	Name of Person
<input checked="" type="checkbox"/>	Safe Vessel Operation, including motoring, docking, and operation of sediment and surface water sampling equipment	Gravity Captains: Mike Duffield, Rene Trudeau, Peter Jenkins, John Schaefer. Gravity Deckhands/Scientists: Shawn Hinz, Jeff Wilson, Jeff Schut, Chad Furulie, Edward Sloan. Ballard Marine: <i>To be identified in the HASP Addendum.</i> DEA: <i>To be identified in HASP Addendum.</i>
<input checked="" type="checkbox"/>	Diving	Global Diving: <i>To be identified in HASP Addendum</i>
<input checked="" type="checkbox"/>	Electrofishing	AECOM: <i>To be identified in HASP Addendum.</i>

6.0 HAZARD ASSESSMENT AND CONTROL

AECOM has adopted an approach to hazard assessment and control that incorporates both qualitative and quantitative methods to identify hazards and the degree to which they may impact employees and AECOM operations. See [S3AM-209-PR](#), Risk Assessment and Management, for details regarding AECOM's process. This approach involves the following:

6.1 SH&E PROCEDURES

All AECOM SH&E procedures, in their controlled copy version, are available on the [internal SH&E Policy and Procedures ecosystem page](#). Programmatic procedures referenced in this document (for example SH&E Training) do not need to be printed for inclusion in this HASP. Only procedures that are needed for field activity reference and application **MUST** be printed in full and included in this HASP. The applicable field procedures checklist is in the Physical Hazards section below, and procedures are included in **Attachment B**.

6.2 PRE-JOB HAZARD ASSESSMENT/JOB SAFETY ANALYSIS

A pre-job hazard assessment or JSA is to be developed for each discrete task planned as part of the project. This assessment lays out the steps of the job, potential hazards, and mitigation measures. Form [S3AM-209-FM4](#) or a client-required equivalent may be used. A blank copy is included in **Attachment D**.

6.3 TASK HAZARD ASSESSMENT

The THA is a handwritten field form based on "Stop and Think" that is the first thing you do before starting work activities, often paired with the daily tailgate meeting or work permit issuance. Not all risks can be anticipated in this HASP or the pre-job hazard assessment process; therefore, the THA is used to assess, mitigate, and document the study area-specific conditions and changes to the hazard profile prior to and throughout the work task. Proper implementation of the THA program protects worker health and safety. A blank THA form is included in **Attachment D**. The THA must be signed by all employees each day and initialed whenever a changed condition provokes a change in hazard controls.

6.3.1 Hazard Categories

JSAs and THAs should include consideration of the following hazard categories when identifying hazards and task specific controls:

- Energy Sources (line of fire, electricity, pressure, compression/tension)
- Fall (slip/trip, fall to same level, fall from height)
- Contact with (struck against, struck by, contact with sharp/abrasives)
- Caught (in, under, between, by)
- Strain/Overexertion (lifting, repetition, push/pull, bending, twisting)
- Exposure (temperature, radiation, noise, chemicals, radiation, hazardous atmosphere)

6.4 4-SIGHT

When preparing hazard assessments and throughout the day, workers should use 4-Sight. This is a mental process through which workers ask themselves (and each other) four questions designed to effectively assess hazards. Using these questions during each task, especially those without formal JSAs or THAs, will help workers identify hazards and condition changes so that they can control them or stop work to seek assistance.

- 1) What am I about to do?
- 2) What could go wrong?
- 3) What could be done to make it safer?
- 4) What have I done to communicate the hazards?



7.0 PHYSICAL HAZARD ASSESSMENT

7.1 PHYSICAL HAZARDS

A physical hazard is a hazard that threatens the physical safety of an individual; contact with the hazard typically results in an injury. The following table summarizes the physical hazards or activities containing physical hazards present at the study area and the associated procedures that address protection and prevention of harm.

All checked procedures MUST be included in Attachment B for implementation and reference. Check all applicable hazards/ activities and add description of the hazard.

	Hazard/ Activity (note: text in this column links to procedure)	Description	Applicable Procedure
<input type="checkbox"/>	Abrasive Blasting		S3AM-335-PR
<input type="checkbox"/>	Aerial Work Platforms		S3AM-323-PR
<input type="checkbox"/>	All-Terrain Vehicles		S3AM-319-PR
<input type="checkbox"/>	Blasting and Explosives		S3AM-336-PR
<input type="checkbox"/>	Bloodborne Pathogens		S3AM-111-PR
<input type="checkbox"/>	Cofferdams		S3AM-344-PR
<input checked="" type="checkbox"/>	Cold Stress	Open water and during winter months	S3AM-112-PR
<input type="checkbox"/>	Compressed Air Systems and Testing		S3AM-337-PR
<input type="checkbox"/>	Compressed Gases		S3AM-114-PR
<input type="checkbox"/>	Concrete Work		S3AM-338-PR
<input type="checkbox"/>	Confined Spaces		S3AM-301-PR
<input type="checkbox"/>	Corrosive Reactive Materials		S3AM-125-PR
<input checked="" type="checkbox"/>	Cranes and Lifting Devices (vessel mounted A-frame)		S3AM-310-PR
<input type="checkbox"/>	Demolition		S3AM-339-PR
<input checked="" type="checkbox"/>	Diving (scientific and commercial)	Open water between; locations to be determined.	S3AM-334-PR
<input type="checkbox"/>	Drilling, Boring & Direct Push Probing		S3AM-321-PR
<input type="checkbox"/>	Electrical Safety		S3AM-302-PR
<input type="checkbox"/>	Excavation		S3AM-303-PR
<input type="checkbox"/>	Fall Protection		S3AM-304-PR
<input type="checkbox"/>	Flammable and Combustible Liquids		S3AM-126-PR
<input type="checkbox"/>	Gauge Source Radiation		S3AM-122-PR
<input checked="" type="checkbox"/>	Hand and Power Tools	Aboard research vessel	S3AM-305-PR
<input checked="" type="checkbox"/>	Hazardous Waste Operations	Aboard research vessel while handling sediment and surface water	S3AM-117-PR
<input checked="" type="checkbox"/>	Heat Stress	Open water during summer months	S3AM-113-PR

<input type="checkbox"/>	Heavy Equipment		S3AM-309-PR
<input type="checkbox"/>	High Altitude		S3AM-124-PR
<input type="checkbox"/>	Highway and Road Work		S3AM-306-PR
<input type="checkbox"/>	Hoists Elevators and Conveyors		S3AM-343-PR
<input type="checkbox"/>	Hot Work		S3AM-332-PR
<input type="checkbox"/>	Ladders		S3AM-312-PR
<input type="checkbox"/>	Lockout Tagout		S3AM-325-PR
<input type="checkbox"/>	Machine Guarding Safe Work Practice		S3AM-326-PR
<input checked="" type="checkbox"/>	Marine Safety and Vessel Operations	Willamette River from RM 1.8 to RM 28.4	S3AM-333-PR
<input type="checkbox"/>	Material Storage		S3AM-316-PR
<input type="checkbox"/>	Mine Site Activities		S3AM-341-PR
<input type="checkbox"/>	Mining Operations		S3AM-345-PR
<input type="checkbox"/>	Non-Ionizing Radiation		S3AM-121-PR
<input type="checkbox"/>	Overhead Lines		S3AM-322-PR
<input type="checkbox"/>	Powder-Actuated Tools		S3AM-327-PR
<input type="checkbox"/>	Powered Industrial Trucks		S3AM-324-PR
<input type="checkbox"/>	Radiation		S3AM-120-PR
<input type="checkbox"/>	Railroad Safety		S3AM-329-PR
<input type="checkbox"/>	Respiratory Protection		S3AM-123-PR
<input type="checkbox"/>	Scaffolding		S3AM-311-PR
<input type="checkbox"/>	Steel Erection		S3AM-340-PR
<input type="checkbox"/>	Temp. Floors, Stairs, Railings, Toe-boards		S3AM-342-PR
<input type="checkbox"/>	Underground Utilities		S3AM-331-PR
<input type="checkbox"/>	Underground Work		S3AM-330-PR
<input type="checkbox"/>	Wildlife, Plants, and Insects		S3AM-313-PR
<input type="checkbox"/>	Working Alone		S3AM-314-PR
<input checked="" type="checkbox"/>	Working On and Near Water	On-board research vessel	S3AM-315-PR

8.0 CHEMICAL HAZARD ASSESSMENT

AECOM will perform tasks that can expose personnel to a variety of hazards due to the operational activities, physical conditions of the work locations, and potential presence of environmental contaminants. This section presents a variety of potential chemical hazards, exposure pathways, and related mitigation actions. See [S3AM-110-PR](#), Toxic and Hazardous Substances, for information on planning, training, monitoring, and details on several specific chemicals (benzene, cadmium, chromium, hydrogen sulfide, lead, and silica).

8.1 POTENTIAL CHEMICAL HAZARDS

Table 8.1 Summary of Hazardous Properties of Contaminant Exposure Hazards

IP: Ionization Potential

PEL: OSHA Permissible Exposure Limits TLV: Threshold Limit Values (American Conference of Governmental Industrial Hygienists [ACGIH])

	Chemical Name	Maximum Concentration Found On-Site	Media	Primary Routes of Exposure	PEL	TLV	IP electron volts (eV)
METALS							
☒	Arsenic	132 mg/kg	Sediment	Dermal	0.05mg/m ³	0.5 mg/m ³	n/a
		143 mg/kg	Soil				
		0.75 µg/L	Surface Water				
		77 µg/L	Porewater				
☒	Cadmium	44 mg/kg	Sediment	Dermal	0.005 mg/m ³	0.01 mg/m ³ Respirable Fraction: 0.002 mg/m ³	n/a
		26 mg/kg	Soil				
		36 µg/L	Porewater				
☒	Chromium	1.92 µg/L	Surface Water	Dermal	0.5 mg/m ³	0.5 mg/m ³	n/a
		147 µg/L	Porewater				
☒	Copper	3,290 mg/kg	Sediment	Dermal	1.0 mg/m ³	1.0 mg/m ³	n/a
		13,300 mg/kg	Soil				
		3.68 µg/L	Surface Water				
		182 µg/L	Porewater				
☒	Lead	13,400 mg/kg	Sediment	Dermal	0.05 mg/m ³	0.05 mg/m ³	n/a
		4,160 mg/kg	Soil				
		166 µg/L	Porewater				
☒	Manganese	66,200 µg/L	Porewater	Dermal	5 mg/m ³	0.2 mg/m ³	n/a
☒	Mercury	65 mg/kg	Sediment	Dermal	0.1 mg/m ³	0.025 mg/m ³	n/a
		19 mg/kg	Soil				
☒	Vanadium	379 µg/L	Porewater	Dermal	0.5 mg/m ³	0.05 mg/m ³	n/a
☒	Zinc	9,000 mg/kg	Sediment	Dermal	15 mg/m ³	10 mg/m ³	n/a
		9,470 mg/kg	Soil				

	Chemical Name	Maximum Concentration Found On-Site	Media	Primary Routes of Exposure	PEL	TLV	IP electron volts (eV)
		58 µg/L	Surface Water				
		983 µg/L	Porewater				
PESTICIDES							
<input checked="" type="checkbox"/>	2,4-5-TP (Silvex)	22 µg/L	Porewater	Dermal	None	None	n/a
<input checked="" type="checkbox"/>	2,4-D	0.97 µg/L	Porewater	Dermal	10.0 mg/m ³	10.0 mg/m ³	n/a
<input checked="" type="checkbox"/>	aldrin	1,340 µg/kg	Sediment	Dermal	0.25 mg/m ³	0.25 mg/m ³	n/a
		0.005 µg/L	Surface Water				
<input checked="" type="checkbox"/>	dieldrin	356 µg/kg	Sediment	Dermal	0.25 mg/m ³	0.25 mg/m ³	n/a
<input checked="" type="checkbox"/>	Lindane/ gamma BHC	430 µg/kg	Sediment	Dermal	0.5 mg/m ³	0.5 mg/m ³	n/a
		22 µg/L	Porewater				
<input checked="" type="checkbox"/>	DDx, DDD, DDE, DDT*	3,600,000 µg/kg	Sediment	Dermal	1 mg/m ³	0.5 mg/m ³	n/a
		150 µg/kg	Soil				
		0.02 µg/L	Surface Water				
		5.7 µg/L	Porewater				
<input checked="" type="checkbox"/>	Chlordanes	2,300 µg/kg	Sediment	Dermal	0.5 mg/m ³	0.5 mg/m ³	n/a
		0.002 µg/L	Surface Water				
<input checked="" type="checkbox"/>	Hexachlorobenzene	14,000 µg/kg	Sediment	Dermal	None	0.002 mg/m ³	n/a
		22 µg/kg	Soil				
		0.007 µg/L	Surface Water				
<input checked="" type="checkbox"/>	MCPD	34 µg/L	Surface Water	Dermal	None	None	n/a
VOCs and Semi-VOCs							
<input checked="" type="checkbox"/>	1,1-DCE	283 µg/L	Porewater	Inhalation	None	None	10.00
<input checked="" type="checkbox"/>	cis-1,2-DCE	574,000 µg/L	Porewater	Inhalation	200 ppm	200 ppm	9.65
<input checked="" type="checkbox"/>	Benzene	8,200 µg/L	Porewater	Inhalation	1 ppm	0.5 ppm	9.24
<input checked="" type="checkbox"/>	Chlorobenzene	30,000 µg/L	Porewater	Inhalation	75 ppm	10 ppm	9.07
<input checked="" type="checkbox"/>	Ethylbenzene	11.4 µg/L	Surface Water	Dermal Inhalation	100 ppm	20 ppm	8.77
		905 µg/L	Porewater				
<input checked="" type="checkbox"/>	Bis-(2-Ethylhexy l)phthalate (DEHP)	440,000 µg/kg	Sediment	Inhalation	5 mg/m ³	5 mg/m ³	9.64
		27,000 µg/kg	Soil				
		64 µg/L	Surface Water				
<input checked="" type="checkbox"/>	Tetrachloro-ethylene (PCE)	12,000 µg/L	Porewater	Inhalation	100 ppm	25 ppm	9.32
<input checked="" type="checkbox"/>	Trichloroethylene (TCE)	585,000 µg/L	Porewater	Inhalation	100 ppm	10 ppm	9.45

	Chemical Name	Maximum Concentration Found On-Site	Media	Primary Routes of Exposure	PEL	TLV	IP electron volts (eV)
<input checked="" type="checkbox"/>	Toluene	821 µg/L	Porewater	Inhalation	200 ppm	20 ppm	8.82
<input checked="" type="checkbox"/>	Vinyl Chloride	28,900 µg/L	Porewater	Inhalation	1 ppm	1 ppm	9.99
<input checked="" type="checkbox"/>	Xylene	1,430 µg/L	Porewater	Inhalation	100 ppm	100 ppm	8.44, 8.56
OTHER CONTAMINANTS OF CONCERN							
<input checked="" type="checkbox"/>	Cyanide	23 mg/L	Porewater	Inhalation	5 mg/m ³	5 mg/m ³	13.60
<input checked="" type="checkbox"/>	Dioxins/furans	66 µg/kg	Sediment	Inhalation	n/a	n/a	9.19/8.89
		0.0022 µg/kg	Soil				
		0.000009 µg/L	Surface Water				
		0.000013 µg/L	Porewater				
<input checked="" type="checkbox"/>	PAHs, total	53,000,000 µg/kg	Sediment	Inhalation	0.2 mg/m ³	0.2 mg/m ³	n/a
		600,000 µg/kg	Soil				
		605 µg/L	Surface Water				
		21,000 µg/L	Porewater				
<input checked="" type="checkbox"/>	Polychlorinated biphenyls (PCBs)	37,000 µg/kg	Sediment	Absorption, ingestion	1 mg/m ³ (42% chlorine); 0.5 mg/m ³ (54% chlorine)	1 mg/m ³ (42% chlorine); 0.5 mg/m ³ (54% chlorine)	n/a
		1,020 µg/kg	Soil				
		0.02 µg/L	Surface Water				
<input checked="" type="checkbox"/>	Perchlorate	210,000 µg/L	Porewater	Dermal Inhalation	None	None	n/a
<input checked="" type="checkbox"/>	TPH-Diesel	28,800 µg/L	Porewater	Inhalation	n/a	100 mg/m ³	n/a
<input checked="" type="checkbox"/>	Tributyltin	90,000 µg/kg	Sediment	Dermal	None	None	n/a
		9,470 µg/kg	Soil				
		0.004 µg/L	Surface Water				

* Exposure limits based on DDT.

** Exposure limits based on chlordane.

"None" is listed where there are no established values in OSHA or ACGIH.

8.2 POTENTIAL EXPOSURE PATHWAYS

Occupational exposure to chemical hazards associated with the work activities could potentially occur by two primary routes (inhalation and skin contact) and one indirect route (incidental ingestion).

8.2.1 Inhalation

Constituents that potentially pose an occupational concern to employees by the inhalation route are volatile organic compounds (VOCs) and potentially semi-volatile organic compounds (SVOCs) when handling sediment on the vessel and in the processing laboratory. VOCs are also present in porewater samples; however, porewater sampling is considered a closed system where porewater is not exposed to the ambient air. In the event of a failure of the closed system (e.g., leak or residual sediment found on sampling device), exposure is limited by sample size and known/expected concentration of contaminants in porewater. Air monitoring procedures are outlined in Section 8.4.

8.2.2 Skin Contact

Personnel handling residual product or waste and associated equipment may be exposed to chemical hazards by skin contact or adsorption. However, exposure is expected to be limited since workers will be required to wear appropriate PPE (i.e., appropriate work gloves, body clothing, and/or face shield).

8.2.3 Ingestion

Personnel handling residual product or waste and associated equipment, including project hazardous materials, may be exposed by incidental ingestion. Typically, this exposure occurs if proper PPE was not used or personal hygiene was not practiced. Personal protection against exposure via ingestion can be accomplished by performance of proper decontamination procedures when exiting contaminated work areas, as well as using the correct PPE.

8.3 DECONTAMINATION

All possible and necessary steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities. Decontamination steps are outlined in Hazardous Waste Operations procedure [S3AM-117-PR](#). Some key elements are as follows:

- All persons and equipment entering the EZ shall be considered contaminated, and thus, must be properly decontaminated prior to exiting to clean areas of the study area. These EZ areas are identified in two locations:
 - Immediate area surrounding the collection of sediment (this will incorporate a portion of the sampling vessel deck). This will also be the location where the sediment will be stored. This location will be identified during the morning tailgate meeting.
 - Laboratory processing area where samples are processed and stored for laboratory shipment.
- Avoid reactions between the solutions and contaminated materials. Review the applicable SDS.
- All contaminated PPE and decontamination materials shall be contained, stored, and disposed of in accordance with requirements determined by management.
- Use caution while working around decontamination stations, including the decontamination pad, which may be a slip or trip hazard.
- Use disposable equipment when possible and practical.

- All employees performing equipment decontamination shall wear the appropriate PPE outlined in the Pre-Job Hazard Assessments to protect against exposure to contaminated materials. The level of PPE may be equivalent to the level of PPE required in the EZ. Other PPE may include splash protection, such as face-shields and splash suits, and knee protectors.
- All decontaminated equipment shall be visually inspected for contamination prior to leaving the Contaminant Reduction Zone.

Decontamination procedures and equipment, equipment for decontamination procedures, and waste handling for decontamination will be identified in the HASP Addendums that will be appended to this Programmatic HASP.

8.4 AIR MONITORING

Monitoring shall be performed within the work area on-site to detect the presence and relative levels of toxic substances. The data collected throughout monitoring shall be used to determine the appropriate levels of PPE. Monitoring shall be in accordance with Exposure Monitoring Procedure [S3AM-127-PR](#) and specified in the work permit and/or JSAs for the tasks. Key elements of the procedure include:

- Calibration of monitoring equipment and/or daily bump tests to verify calibrations and confirm alarm function.
- Personal monitoring and result evaluation must be directed by a Certified Industrial Hygienist or Certified Safety Professional.

Real-Time Exposure Measurement/ Equipment

Monitoring shall be performed within the work area on-site to detect the presence and relative levels of toxic substances. The data collected throughout monitoring shall be used to determine the appropriate levels of PPE. Monitoring shall be conducted as specified in the work permit and JSAs as work is performed. All instrumentation need to be rated intrinsically safe to prevent fire or explosion.

Table 8.2 Air Monitoring Instrumentation

	Instrument	Manufacturer/Model	Substances Detected
<input checked="" type="checkbox"/>	Photo Ionization Detector (PID)	RAE Systems mini-RAE Photovac Microtip HNu Model Hnu (min. 10.6 eV bulb)	<ul style="list-style-type: none"> • Petroleum hydrocarbons • Organic Solvents
<input checked="" type="checkbox"/>	Chip Monitoring System for specific chemical detection	Drager CMS	<ul style="list-style-type: none"> • Specific compounds if PID indicates presence above action level and after consulting with AECOM SH&E Lead and AECOM CIH

Health and Safety Action Levels

An action level is a point at which increased protection is required due to the concentration of contaminants in the work area or other environmental conditions. The concentration level (above background level) and the ability of the PPE to protect against that specific contaminant determine each action level. The action levels are based on concentrations in the breathing zone.

If ambient levels are measured which exceed the action levels in areas accessible to unprotected personnel, necessary control measures (barricades, warning signs, and mitigation actions to limit, etc.) must be implemented prior to commencing activities at the specific work area.

Personnel should also be able to upgrade or downgrade their level of protection with the concurrence of Site Supervisor or Site Safety Officer or the Safety Manager.

Reasons to upgrade:

- Known or suspected presence of dermal hazards
- Occurrence or likely occurrence of gas, vapor, or dust emission
- Change in work task that will increase the exposure or potential exposure to hazardous materials

Reasons to downgrade:

- New information indicating that the situation is less hazardous than was originally suspected
- Change in site conditions that decrease the potential hazard
- Change in work task that will reduce exposure to hazardous materials

Monitoring Procedures

The monitoring procedures shown below are general guidelines for sampling activities. **The reviewing SH&E Manager may modify any or all of these for site-specific application.** A reading in excess of an action level outlined below will require additional ventilation for 30 minutes, followed by re-monitoring.

Table 8.3 Tasks Requiring Air Monitoring, Procedures, and Action Levels

Tasks requiring air monitoring	Parameter	Zone Location and Monitoring Interval	Action Level	Response Action
Sediment trap collection on vessel Surface sediment collection on vessel Subsurface sediment collection Sediment sampling in processing laboratory	VOCs and volatile hydrocarbons (total by PID)	Breathing zone – continuously during tasks where exposure to VOCs and volatile hydrocarbons is possible	< 5 ppm (PID Units)	Continue monitoring; may continue work in required PPE.
			5 - 25 ppm (PID Units sustained for 5 minutes)	1) STOP WORK and notify PM. 2) Investigate the cause of elevated VOC measurements and identify measures to reduce concentrations (cover impacted soils, ventilation, etc.). 3) Work activities shall only continue once levels have decreased to < 5 units above background. 4) If levels continue above 5 units, the team shall contact the Project Manager and Project SH&E Lead to report the change of conditions. 5) Perform air monitoring for benzene and vinyl chloride using compound specific meters (e.g., Draeger CMS for benzene and vinyl chloride or equivalent instrument) 6) Compare readings to action levels for benzene (0.25 ppm) and vinyl chloride (0.25 ppm). Resume work if results are below action levels and Total VOC measurements are below 5 Units 7) If levels continue above 5 ppm, only individuals who are medically qualified to wear respiratory protection are permitted to continue work activities with Project Manager and Project SH&E Lead approval. Don Level C PPE (organic vapor respirator cartridges), continue monitoring, and initiate continuous air monitoring for benzene.
			> 25 ppm (PID Units sustained for 5 minutes)	Cease work, exit, and contact the Safety Officer, Supervisor, and Project Manager.

Tasks requiring air monitoring	Parameter	Zone Location and Monitoring Interval	Action Level	Response Action
	Benzene (by PID with benzene-specific separation tube or equivalent device)	Breathing zone, continuously where indicated by VOC readings.	> 0.25 ppm (using compound-specific meter)	Cease work, exit the area, and contact the Safety Officer, Supervisor, and Project Manager. Work can only be resumed after consulting with an AECOM CIH.
	Vinyl Chloride (by Drager CMS or equivalent device)	Breathing zone, continuously where indicated by VOC readings.	> 0.25 ppm (using compound-specific meter)	Cease work, exit the area, and contact the Safety Officer, Supervisor, and Project Manager. Work can only be resumed after consulting with an AECOM CIH.

For calculations determining the benzene and vinyl chloride action levels, please see Attachment G.

9.0 ENVIRONMENTAL IMPACT PREVENTION

AECOM strives to avoid or control environmental impacts from our operations through planning and implementation of best practices as well as preparing responses to react to environmental incidents. Environmental Compliance procedure [S3AM-204-PR](#) provides details on permitting and planning requirements.

	Potential Environmental Impact	Description of hazard and permit or control being implemented
<input type="checkbox"/>	Air Emissions	
<input checked="" type="checkbox"/>	Hazardous Waste Management	Storage, treatment, or disposal of hazardous waste at the study area, RCRA Part B permits or equivalent, 90-day storage procedures, etc.
<input type="checkbox"/>	Storm Water Pollution	
<input type="checkbox"/>	Wetlands	
<input type="checkbox"/>	Critical Habitat	
<input type="checkbox"/>	Other:	

9.1 INCIDENTAL SPILL PREVENTION AND CONTAINMENT

Spill prevention and containment planning must be conducted and appropriate control measures established, consistent with regulatory requirements. Personnel are not expected to perform a response action related to an uncontrolled release of a hazardous substance. However, in the event of an incidental release of a hazardous material, a response will be performed to absorb, neutralize, or otherwise control the release within the immediate work area. Procedures contained in the SDS of the hazardous material will be implemented to perform the response. The Emergency Response section of this HASP contains information on spill reporting, pre- and post-spill evaluation, and response.

9.1.1 Spill Prevention and Containment Practices

Work activities may involve the use of hazardous materials (i.e., fuels, solvents) or work involving drums or other containers. When these activities exist, the procedures outlined below will be used to prevent or contain spills:

- All hazardous material will be stored in appropriate containers and labelled.
- Tops/lids will be placed back on containers after use.
- Containers of hazardous materials will be stored appropriately away from moving equipment.
- Containers shall only be lifted using equipment specifically manufactured for that purpose.
- Drums/containers will be secured and handled in a manner that minimizes spillage and reduces the risk of musculoskeletal injuries.

- Equipment will be inspected daily for signs of leaks, wear, or strain on parts that, if ruptured or broken, would result in a spill.
- Refueling should occur in designated areas where incidental spills can be prevented from reaching permeable ground surfaces or surface water.
- Whenever possible, position parked or stationary equipment over secondary containment and/or absorbent materials to prevent spills from reaching permeable ground surfaces.
- A spill response kit, to include an appropriate empty container, materials to allow for booming or diking the area to minimize the size of the spill, and appropriate clean-up material (i.e., speedy dri, absorbent pads, etc.) will be available on the project study area and positioned for quick and easy access.

10.0 PERSONAL PROTECTIVE EQUIPMENT

PPE is considered the last line of defense in hazard control. PPE is meant to protect workers when all other methods (elimination, engineering, and administrative) have been exhausted. All employees must be trained in the proper use and maintenance of PPE. See Procedure [S3AM-208-PR](#), Personal Protective Equipment.

A PPE assessment (see [S3AM-208-FM1](#)) can be performed to help determine PPE requirements. Pre-Job Hazard Assessments (Pre-JHAs) will specify what PPE is required for each activity and where. The Minimum Required PPE per AECOM PPE and HAZWOPER Procedures (where applicable):

- Hard hats will be required when working in areas with overhead hazards or where potential energy is stored and the release of it could be hazardous, (e.g. working on the vessel near lines/cables under tension, when winching, using A-Frames, sediment sampling, etc.).
- Safety glasses w/ side shields (may be clear or shaded).
- Sturdy work boots shall be worn at all times. The crew shall wear safety toe work boots whenever the crew is lifting items > 25 pounds, working around heavy moveable objects, or there is a risk of falling overhead objects.
- US Coast Guard Type III or IV approved personal floatation device (when working near or over water).
- Long pants and shirts with sleeves (short or long—must cover shoulders; no tank or muscle-shirt styles) Complete the table below for task-specific PPE.

Additional PPE Needed On-Site (to encompass all task specific additions and upgrades)

Face/Eyes	Head/Ears
<input type="checkbox"/> Spoggles (Safety glasses with foam liner for dust protection) <input type="checkbox"/> Welding mask/goggles <input checked="" type="checkbox"/> Chemical goggles <input type="checkbox"/> Face shield (splash) <input type="checkbox"/> Face shield (impact)	<input checked="" type="checkbox"/> Helmet with chin strap <input type="checkbox"/> Wide-brimmed hat <input type="checkbox"/> Earplugs <input type="checkbox"/> Over-ear hearing protection
Hands	Legs/Feet
<input checked="" type="checkbox"/> Nitrile <input type="checkbox"/> Leather <input checked="" type="checkbox"/> Cut, abrasion, and puncture-resistant <input type="checkbox"/> Impact-resistant <input type="checkbox"/> Other chemical resistant: _____	<input type="checkbox"/> High ankle boots <input type="checkbox"/> Snake guards <input type="checkbox"/> Rubber boots/waders <input type="checkbox"/> Metatarsal Guards <input type="checkbox"/> Electrically resistant boots

Body	Equipment
<input checked="" type="checkbox"/> Sunscreen	<input type="checkbox"/> Air/noise monitoring equipment (specify:
<input checked="" type="checkbox"/> Insect repellent (DEET)	
<input checked="" type="checkbox"/> Permethrin applied to clothing	<input type="checkbox"/> Traffic/Work zone controls equipment (specify):
<input checked="" type="checkbox"/> Long-sleeved shirt	
<input checked="" type="checkbox"/> High-visibility vest	<input checked="" type="checkbox"/> Communication beyond cell phones (specify:
<input checked="" type="checkbox"/> High-visibility pants	Satellite phone (if cell service does not cover entire study area); VHF radios

11.0 STUDY AREA CONTROL

The purpose of study area control is to protect the public from inadvertently coming into contact with hazards and to protect AECOM employees being impacted by hazards. This section details the equipment and actions needed to promote optimal study area control.

11.1 WORKZONE CONSIDERATIONS

Study area layout and study control need to be coordinated to achieve a productive work environment and efficient work process while minimizing exposure of employees and the public to hazards associated with the work.

Consider the following items when planning the study area layout and controls:

- Boat docking/mooring
- Loading/unloading areas
- Boat launching
- “Line of Fire” hazards—overhead utilities, falling/ tipping equipment, release of energy/pressure, flying debris
- Noise, dust, odor suppression
- Contamination containment and decontamination area layout
- Restricted access for areas requiring special training, skills, or certifications
- Overnight safety and security needs

11.1.1 DEFINED WORK ZONES

The exclusion zone, contaminant reduction zone, and support zone for the project activities are described below:

Exclusion Zone:

- Immediately surrounding the sediment collection area. The sediment collection area on the vessel will include a portion of the deck dedicated to where the collected sediment media and associated equipment are retrieved for the following activities:
 - Sediment trap sampling
 - Surface sediment sampling
 - Subsurface sediment sampling

This will also be the location where the sediment media will be stored on the vessel for transport to the laboratory. This location will be identified during the morning tailgate meeting.

After all sediment has been collected, the samples will be transported to the processing laboratory. The exclusion zone in the processing laboratory will be the area where sediment samples are processed and stored for shipment to the analytical laboratory.

- Immediate area surrounding the retrieval and collection of porewater samples and associated sampling equipment on the vessel. This will also include the location where porewater samples will be stored until transport to the analytical laboratory. This will be identified during the tailgate meetings.

Contaminant Reduction Zone

- The contaminant reduction zone is the area where decontamination takes place; the contaminant reduction zone is identified in two locations:

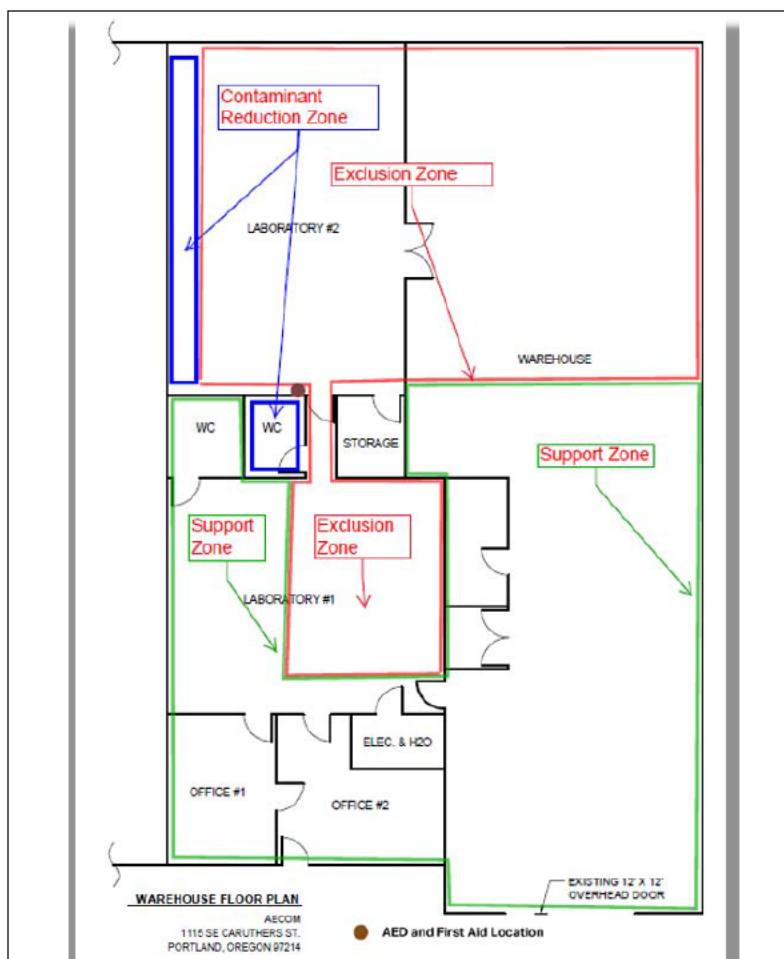
- On the vessel, the immediate area outside the exclusion zone where sampling media is collected and associated equipment (e.g., sediment traps, porewater sampling equipment) are decontaminated.
- In the processing laboratory, the immediate area outside the exclusion zone where sampling of sediment takes place and associated equipment is decontaminated.

Support Zone

- The support zone consists of the following areas:
 - All clean spaces used by the project (e.g., wheel house of sampling vessel). The support zone will include a portion of the deck where visitors may stand and remain outside the exclusion and contaminant reduction zones. The support zone also includes vessels and equipment not involved in sediment sampling.
 - In the processing laboratory, this will include all areas where workers or visitors would not be exposed to contaminants in the exclusion zone or contaminant reduction zone.

The Exclusion Zone, Contaminant Reduction Zone, and Support Zone are illustrated below.





Check the description of the study area controls already in place:

<input checked="" type="checkbox"/>	The onshore processing facility is within a facility/property with secure and restricted access provided by AECOM
<input type="checkbox"/>	Work area is enclosed within facility/ property but access is not restricted via locks, guards, or gates
<input type="checkbox"/>	Work area is on a property that is open and access by the public is likely
<input type="checkbox"/>	Work area is on a property that is open but access by the public is unlikely
<input type="checkbox"/>	Work area is in a roadway or right of way of a roadway (Traffic Control Plan required S3AM-306-PR)
<input type="checkbox"/>	Work area is on or near railroad (including right of way, active lines, and crossings)
<input checked="" type="checkbox"/>	Other (describe): Work area is on a boat in the Willamette River. Public boaters are likely and crew will cease work if boaters approach closer than 50 feet

Check and describe the controls that need to be added to protect the public and the AECOM work team. None applicable.

	Control Item	Description of Type and Application
<input type="checkbox"/>	Fence	
<input type="checkbox"/>	Locks	
<input type="checkbox"/>	Barricades	
<input type="checkbox"/>	Cones	
<input type="checkbox"/>	Tape	
<input type="checkbox"/>	Hole Covers	
<input type="checkbox"/>	Other:	

11.2 SIMULTANEOUS AND NEIGHBORING OPERATIONS

Simultaneous and neighboring operations present a need for added coordination and communication to address hazards that are presented by multiple operations.

Activity/Company	Hazard	Controls/Mitigations and Communication methods
Simultaneous Operation (within the study area)		
Portland Harbor is an active port with ship traffic, dock work, and a variety of other activities occurring in the study area	Vessel collisions, disturbance/interference with sampling equipment	The Portland Harbor Harbormaster will be used as a point of contact for coordinating with Simultaneous and Neighboring operations. If there are significant Simultaneous and Neighboring Operations, additional coordination needs will be determined on a case by case basis.
Neighboring Operation (outside/ bordering the study area)		
Portland Harbor is an active port with ship traffic, dock work, and a variety of other activities occurring outside and adjacent to the study area	Vessel collisions during transit to and from study area	The Portland Harbor Harbormaster will be used as a point of contact for coordinating with Simultaneous and Neighboring operations. If there are significant Simultaneous and Neighboring Operations, additional coordination needs will be determined on a case by case basis.

11.3 SECURITY

All projects should be reviewed for the potential for personal security issues (e.g., assault, robbery, threat, etc.).
Check all the following that apply: N/A

- ☐ Project located in a higher crime area or has a history of security incidents
- ☐ Working outside of regular cellular telephone service
- ☐ Idle property with potential for trespasser(s) to shelter in buildings/structures and assault personnel
- ☐ Working at night

12.0 EMERGENCY RESPONSE

AECOM requires that all projects plan for reasonably foreseeable emergencies (see Emergency Response Planning Procedure [S3AM-010-PR](#)). Prior to the start of study implementation, all personnel shall review the table below for specific information regarding evacuations, muster points, communication, and other study area- specific emergency procedures. Rehearsal of the emergency response plan will be conducted as part of HASP Addendum orientations provided prior to the start of work for each field task, during daily safety briefings at regular intervals (at least once per week), when any new AECOM or Subconsultant personnel joins the field team, and whenever there is a change in task or significant change in task location. An Incident Response Flow Chart is included in **Attachment A**.

12.1 INCIDENT/EMERGENCY CONTACT INFORMATION

AECOM Contacts			
Name	Title	Telephone Number	Mobile Phone
Jennifer Pretare	Project Manager	206.438.2175	(b) (6)
Nicky Moody Keith Kroeger Jennifer Pretare	Safety Supervisors and Site Safety Officers (Field Coordinators)	503.478.2765 971.271.5901 206.438.2175	
Fred Merrill	PNW Area SH&E Manager	(b) (6)	
Shelley Brown	Regional SH&E Manager	(b) (6)	
Incident Reporting	DCS Incident Reporting & Help Line	800-348-5046	
AECOM Nurse direct	Use only after incident reporting line	877-878-9525	
Client Contacts			
Hans Feige	Client Project Manager	503.543.9700	(b) (6)
Organization/Agency			
Police Department (local)			911
Fire Department (local)			911
Ambulance Service (EMT will determine appropriate hospital for treatment)			911
Boating Emergency (U.S. Coast Guard)			Dial 911 or Call the Coast Guard on VHF Marine Channel 16
Oregon Emergency Response System (OERS):			Dial 911 or Call OERS at 800.452.0311
National Response Center (NRS) (as listed on the US Coast Guard Website)			1.800.424.8802
Hospital: Legacy Emanuel Medical Center, 2801 N Gantenbein Avenue, Portland, OR 97227			503.413.2200
Occupational Clinic: Adventist Health Occupational Medicine, 10201 SE Main Street, Portland, OR 97216			503.408.7010
Poison Control Center			800.222.1222
Pollution Emergency- obtain state spill response number from S3AM-117-ATT1			800.424.8802
			800.348.5046
INFOTRAC (AECOM's account number 74984)			800.535.5053
AECOM Hazardous Material Shipping Help Line			800.381.0664
Public Utilities			
Call Before You Dig			811

12.2 MUSTER LOCATION

The muster location is in the parking lot at the Swan Island Boat Ramp on North Basin Avenue, Portland, Oregon, 97217, as shown with the pin in the photograph below.



12.3 COMMUNICATION PROCEDURES

Use cell phone, satellite phone, and/or marine radio as appropriate.

12.4 CPR/FIRST AID TRAINED PERSONNEL

CPR/First Aid Trained Personnel that will be on-site will be identified in the HASP Addendums for each study.

12.5 INCIDENT REPORTING

Incidents involving or affecting an AECOM employee or subcontractor will be reported in a prompt manner verbally to the Safety Supervisor and Project Manager.

1. If the incident is a significant or life-threatening emergency, the employee or supervisor shall immediately dial 911 or the appropriate emergency contact phone number for your location.
2. The employee or supervisor shall contact the Incident Hotline (800-348-5046).
3. The employee or supervisor must notify their operational leaders and the Area SH&E Manager.
4. The supervisor, or delegate, must make initial notification in [IndustrySafe](#) within 4 hours for significant incidents, or 24 hours for less significant events.
5. Client and account management notifications may also apply. The Project Manager will make any necessary notifications.

Any injury, even if no treatment is required, and any incident for which assistance by SH&E Management is needed must be immediately communicated to the Incident Hotline at 1-800-348-5046.

All incidents are also to be reported to IndustrySafe within the timeframes listed below:

Incident Type	IndustrySafe Reporting Time Frame
Significant Incident, including any injury	→ 4 Hours
All Other Incidents	→ 24 Hours

Significant Incidents include:

- Fatality;
- Amputation;
- Hospitalization for treatment for more than 24 hours (admission);
- Any single event resulting in more than one employee requiring medical treatment or more than one employee being away from work more than 3 days;
- Any SH&E-related Consent Agreement/Order/Lawsuit or enforcement action seeking more than
- \$10,000 or alleging criminal activity;
- Any spill or release of a hazardous material that is reportable to a regulatory agency;
- Any Notices of Violation resulting from not operating within a regulatory agency permit/license or consent;
- Any incident resulting in property damage expected to exceed \$10,000 United States (US) dollars;
- Any security-related incident that could have caused significant harm to an AECOM employee; and/or
- Any Near Miss event that may have resulted in any of the above consequences but because of "luck" did not result in harm to persons, property, or the environment.

All Other Incidents include:

- Any injury or illness to an AECOM employee or subcontractor, even if it does not require medical attention, including work-related injuries/illnesses that have become significantly aggravated by the work environment;
- An injury to a member of the public, or clients, occurring on an AECOM-controlled work area;
- Re-occurring conditions such as back pain or cumulative trauma disorders (e.g., carpal tunnel syndrome);
- Fire, explosion, or flash that is not an intended result of a planned event (e.g., remediation process, laboratory procedure);
- Any incident involving company-owned, rented, or leased vehicles (including personal vehicles used for company business); and/or
- Any failure to comply with the requirements of a regulatory permit issued to AECOM.

Scan the QR code below to access IndustrySafe reporting system from your smartphone/ device.



12.6 MEDICAL EMERGENCIES

In the event of a life-threatening or critical emergency, AECOM employees should dial 911 and follow the recommended instructions. However, in less serious situations, an injured employee or a co-worker should contact the Incident Hotline at 800-348-5046 to ensure that the employee receives the best care at the best time (i.e., within the first hour following an injury or potential injury). By contacting the Incident Hotline, the worker can be connected with AECOM's nurses for first aid advice. If recommended by the nurse, the supervisor or a co-worker should drive the injured employee to the project-designated clinic or hospital. A map to the designated hospital and clinic is attached as **Attachment A**, and the locations and addresses are included in the table above as well as in the HASP Summary on Page i.

12.7 VEHICLE INCIDENTS

All vehicles should be rented through Carson Wagonlit Travel (accessible via Ecosystem) to ensure that AECOM insurance is included in the rental rate. All other insurances should be declined. AECOM's rental vehicle insurance policy for National/Enterprise or Avis can be found on the DCS Americas [United States](#) or [Canada](#) travel pages. **Drivers MUST print and carry the applicable insurance policy for the rental.**

In the event of a vehicle incident (including collisions as well as mechanical difficulties such as breakdowns and flat tires) the following responses are recommended:

- For breakdowns and flat tires, contact an emergency provider.
- For rental vehicles, contact the rental company.
- To the extent possible, AECOM personnel should not change flat tires or perform similar repairs.
- If a collision has occurred, assess the situation and move all occupants (except the injured) out of further harm's way. If safe to do so, remove the car from the traveled way. Call 911 if necessary, and

- Report the incident to the Incident Hotline at 800-348-5046 as soon as practical. If appropriate, wait for police to arrive before moving vehicles. Provide insurance information to other drivers if necessary or requested and collect the same. If possible, obtain names and phone numbers of witnesses. Take photographs of the scene if possible. DO NOT ADMIT LIABILITY, AGREE TO PAY FOR DAMAGE, OR SIGN A DOCUMENT RELATED TO AN INCIDENT EXCEPT AS REQUIRED BY LAW.

12.8 SPILL OR RELEASE

AECOM employees or subcontractors are not expected to take action or to participate in rescues or responses to chemical releases (including of petroleum products) beyond the initial discovery of the release and immediate mitigation actions such as closing a valve, placing absorbents, and notifying the client and or public emergency response system (911), unless there is a contractual provision for this response and specially trained employees.

12.8.1 Environmental Spill/Release Reporting

All environmental spills or releases of hazardous materials (e.g., fuels, solvents, etc.), whether in excess of the Reportable Quantity or not, will be reported according to the incident reporting procedure. If any event occurs in the performance of the PDI field work that causes or threatens to cause a release of Waste Material on, at, or from the Site and that either constitutes an emergency situation or that may present an immediate threat to public health or welfare or the environment, Respondents shall:

- Immediately take all appropriate action to prevent, abate, or minimize such release or threat of release.
- Immediately notify the authorized EPA officer orally.
- Take such actions in consultation with authorized EPA officer in a safe manner with respect to the appropriate level of training for the worker(s) and applicable provisions of the Health and Safety Plan.

The Oregon Department of Environmental Quality requires the following spills be reported:

- Spill reporting includes any amount of oil (oil-based fluids) to waters of the state.
- Oil spills on land in excess of 42 gallons.
- Hazardous materials that are equal to the quantities provided in Table 12.2, below.

The following numbers must be called in the event of a release:

The Oregon Emergency Response System:	1-800-452-0311
The National Response Center:	1-800-424-8802
The EPA Project Coordinator (or if he/she cannot be reached) the EPA Emergency Response Unit for Region 10	206-553-7660 (project coordinator – David Zhen) 206-553-1263 (emergency response unit)

Table 12.2- CERCLA Reportable Quantities

Hazardous Substance	Regulatory Synonyms	Final Reportable Quantity (pounds)
1,1,1-Trichloroethane	TCA	1,000
Arsenic	N/A	1
Benzene	N/A	10
Cadmium	N/A	10

Hazardous Substance	Regulatory Synonyms	Final Reportable Quantity (pounds)
Carbon Tetrachloride	N/A	10
Chromium	N/A	5,000
Ethyl Benzene	N/A	1,000
Lead	N/A	10
Mercury	N/A	1
Methyl Ethyl Ketone	MEK	5,000
Nickel	N/A	100
Pentachlorophenol	PCP	10
Selenium	N/A	100
Tetrachloroethylene	Perchloroethylene, PCE	100
Toluene	N/A	1,000
Trichloroethylene	Trichloroethene, TCE	100
Xylene	N/A	100

To the best of the team's ability be ready with the following information:

- Where is the spill?
- What was spilled?
- How concentrated is the spilled material?
- Who spilled the material?
- Is anyone cleaning up the spill?
- Are there resource damages (e.g. impacted wildlife)?
- Who is reporting the spill?
- How we can get back to you?

CERCLA Reportable Quantities can be found at: <http://www.epa.gov/oem/docs/er/302table01.pdf>

The spill containment program addresses the following site-specific information:

- Potential hazardous substance spills and available controls;
- Initial notification and response;
- Spill evaluation and response; and
- Post-spill evaluation.

12.8.2 Spill Evaluation and Response

The Safety Officer is responsible for evaluating spills and determining the appropriate response. When this evaluation is being made, the spill area will be isolated and demarcated to the extent possible. When an incidental release occurs, clean-up personnel will receive instructions in a pre-clean-up meeting as to spill conditions, PPE, response activities, decontamination, and waste handling.

The procedures of the Emergency Response section of this HASP will be immediately implemented when the spill is determined to require emergency precautions and action. If necessary to protect those outside the clean-up area, notification of the appropriate authorities will be made. The table in Section 12.8.1 lists the spill conditions that trigger notification of federal, state, and local agencies.

The following are general measures that response/clean-up personnel shall take when responding to a spill:

- To minimize the potential for a hazardous spill, hazardous substances, control/absorbent media, drums and containers, and other contaminated materials will be properly stored and labeled.
- When a spill occurs, only those persons involved in overseeing or performing spill containment operations will be allowed within the designated hazard areas. If necessary, the area will be roped or otherwise blocked off. Unauthorized personnel will be kept clear of the spill area.
- Appropriate PPE will be donned before entering the spill area.
- Appropriate spill control measures will be applied during spill response.
- Whenever possible without endangerment of personnel, the spill will be stopped at the source or as close to the source as possible.
- Ignition points will be removed if fire or explosion hazards exist.
- Surrounding reactive materials will be removed.
- Drains or drainage in the spill area will be blocked or surrounded by berms to exclude the spilled waste and any materials applied to it.
- Provisions will be made to contain and recover a neutralizing solution, if used.
- Small spills or leaks from a drum, tank, or pipe will require an evacuation to a safe distance in all directions to allow clean-up and to prevent employee exposure. For small spills, sorbent materials such as sand, sawdust, or commercial sorbents (see Table below for sorbent media) will be placed directly on the spill to prevent further spreading and aid in recovery. The table below provides guidance to potentially spilled material, what will be available to contain or clean the spill, and where the material is located.

Typical Spilled Media and Containment Material

Spilled Media	Spill Containment Material	Where Spill Containment Kits are Located
Fuel spill on water	Absorbent socks and booms	On Vessel
Sediment spill	Absorbent socks and booms	In drum storage area

- Spill area will be sprayed with appropriate foam where the possibility of volatile emissions exists.
- If the spill results in the formation of a toxic vapor cloud, from vaporization, reaction with surrounding materials, or the outbreak of fire, further evacuation may be required.
- To dispose of spill waste, all contaminated sorbents, liquid waste, or other spill clean-up will be placed in approved 55-gallon drums for proper storage or disposal as hazardous or non-hazardous (depending on media) waste.

12.8.3 Post-Spill Evaluation

As part of the incident investigation and reporting documentation, a written spill response report shall be prepared at the conclusion of clean-up operations. The report will include, at a minimum, the following information:

- Date of spill incident
- Cause of incident
- Spill response actions
- Any outside agencies involved, including their incident reports
- Lessons learned or suggested improvements

The spill area will be inspected to ensure the area has been satisfactorily cleaned. The use of surface and air sampling will be utilized in this determination as necessary. The root cause of the spill will be examined and corrective steps taken to ensure the engineering and control measures in place have performed as required. If alternative precautions or measures are needed, they will be made available and implemented.

All durable equipment placed into use during clean-up activities will be decontaminated for future utilization. All spill response equipment and supplies will be re-stocked as required.

12.9 FIRE

AECOM employees are not expected to attempt to put out fires. Stop work, notify all AECOM personnel, move upwind, and contact 911 and/or emergency response at the study area. If employees have been properly trained in the operation of a fire extinguisher, they may attempt to put out a small fire, provided that the following conditions are met:

The fire must be small (i.e., smaller than a trash can) and in its early stages.

- The employee must have an escape route.
- The employee must be trained and know they have the right type of extinguisher.
- The employee must be safe from toxic gases.
- There must be no hazardous conditions that could quickly accelerate the fire (i.e., presence of chemicals, especially dry grass, etc.).
- Above all, if in doubt, the employee must not attempt to fight the fire.

13.0 PERSONNEL ACKNOWLEDGEMENT

By signing below, the undersigned acknowledges that he/she has reviewed the AECOM Health and Safety Plan for the Portland Harbor PDI Studies. The undersigned also acknowledges that he/she has been instructed in the contents of this document and understands the information pertaining to the specified work, and will comply with the provisions contained therein. The employee understands that they are NOT to perform any work that they have not been adequately trained for and that they are to stop work if it is unsafe to proceed. Finally, the employee understands to notify the Safety Supervisor and the Incident Hotline at 800-348-5046 for any incident, ***including ANY injury even if no first aid or medical treatment is required.***

[illegible]

Attachment A

Hospital and Clinic Directions/Maps
Incident Reporting and Response
Flow Chart

Hospital Location Maps

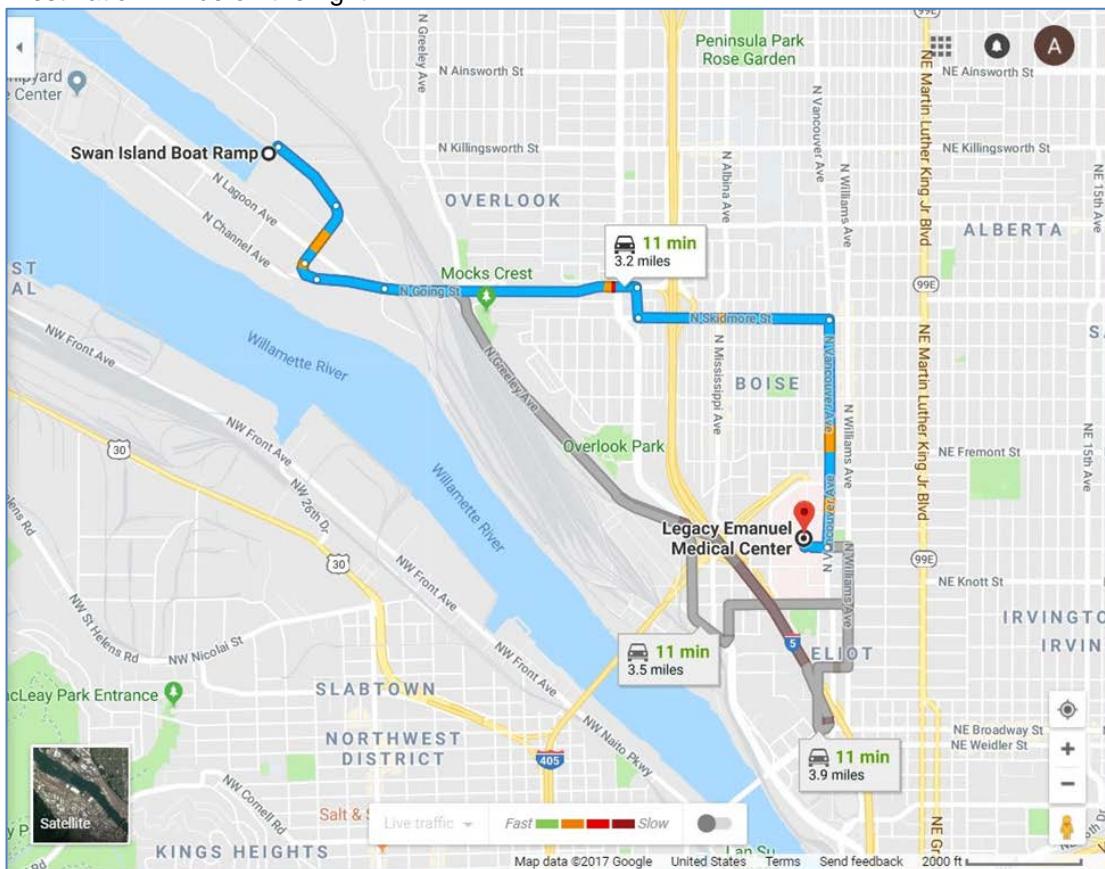
Legacy Emanuel Medical Center

2801 N Gantenbein Ave
Portland, OR 97227

503-413-2200

From Swan Island Boat Ramp:

- 1) Head southeast on N Basin Ave toward N Emerson St
 - 2) Continue onto N Anchor St
 - 3) Use any lane to turn slightly left to stay on N Anchor St
 - 4) Continue straight onto N Channel Ave
 - 5) Continue onto N Going St
 - 6) Turn right onto N Maryland Ave
 - 7) Turn left onto N Skidmore St
 - 8) Turn right onto N Vancouver Ave
 - 9) Turn right onto N Stanton St
- Destination will be on the right.



Hospital Location Maps (continued)

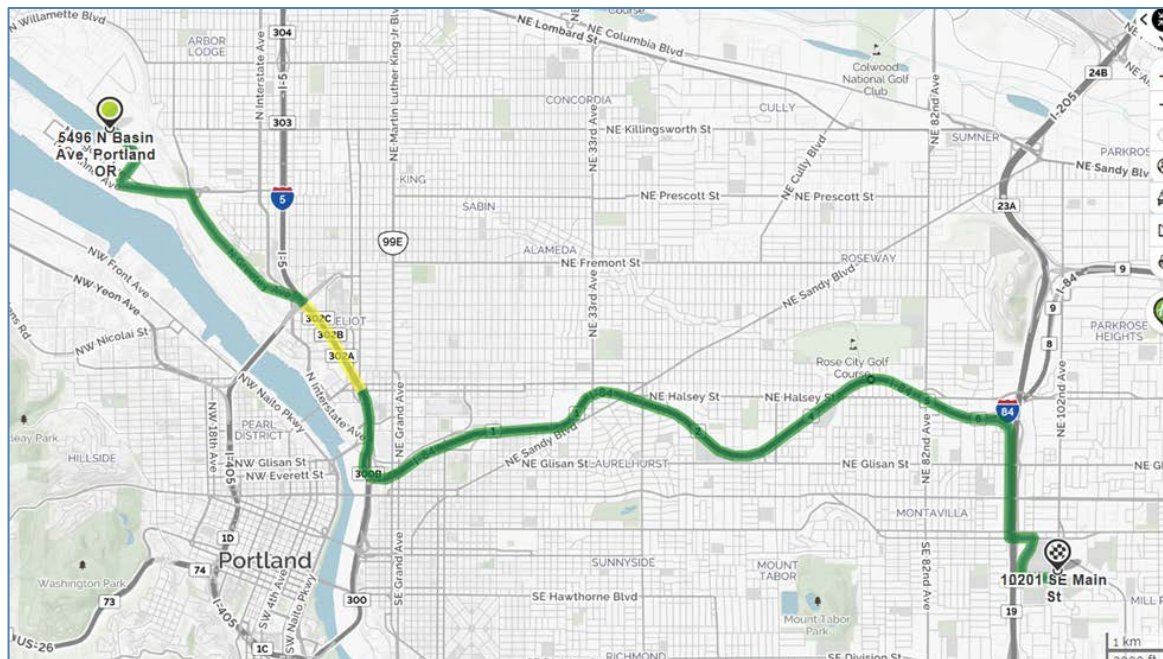
Adventist Health Occupational Medicine

10201 SE Main Street
Portland, OR 97216

503-408-7010

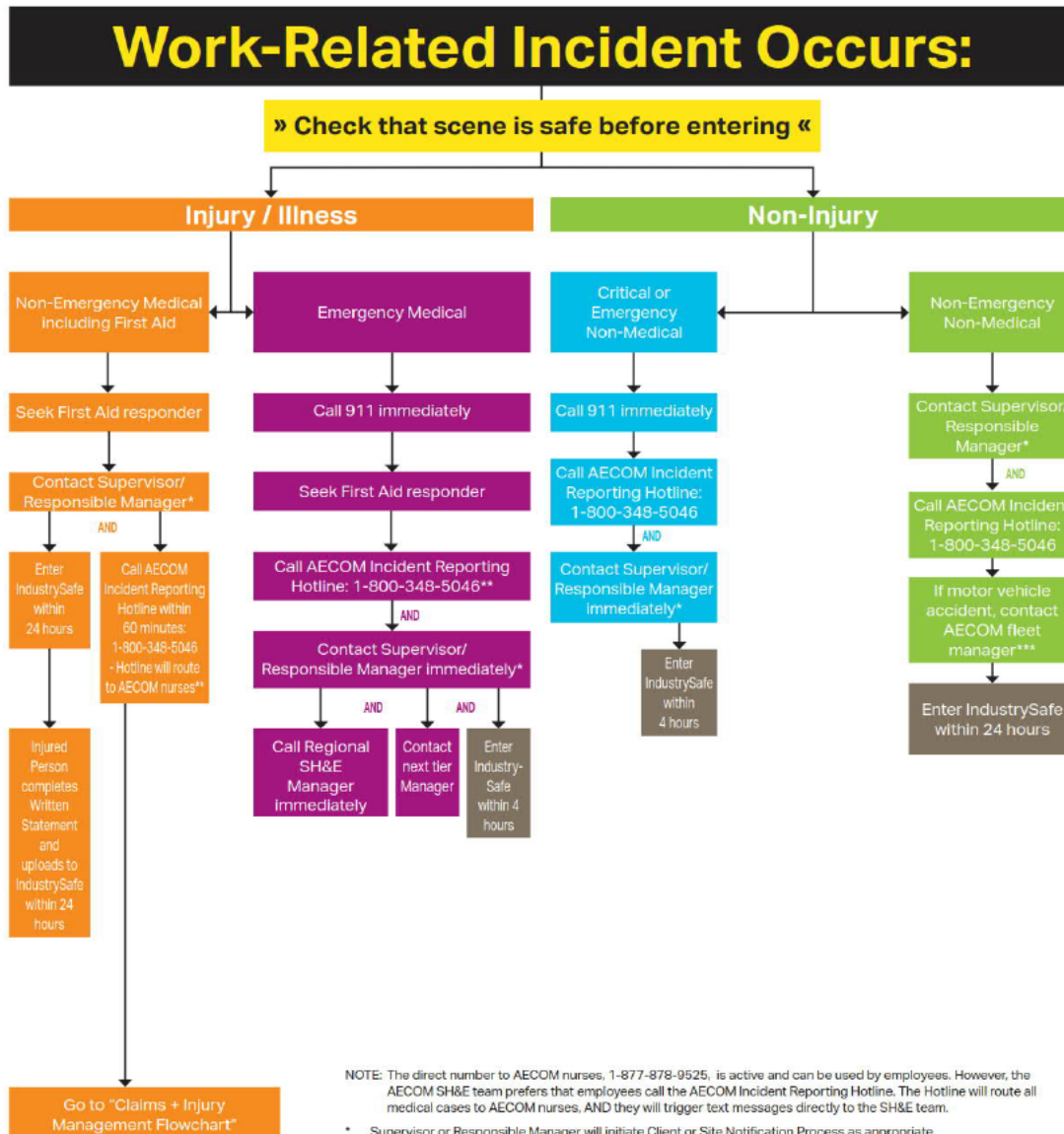
From Swan Island Boat Ramp:

- 1) Head southeast on N Basin Ave toward N Emerson St
- 2) Stay straight to go onto N Anchor St
- 3) Keep left at the fork to continue on N Anchor St
- 4) Turn slight left onto N Channel Ave
- 5) N Channel Ave becomes N Going St
- 6) Turn slight right onto ramp
- 7) Merge onto N Greeley Ave
- 8) Merge onto I-5/Pacific Hwy 1 S toward Salem
- 9) Merge onto I-84 E/US-30 E via Exit 301 toward The Dalles
- 10) Take Exit 6 toward Salem
- 11) Keep right to take the Glisan St/Stark St ramp
- 12) Turn left onto SE Washington St
- 13) Turn right onto SE 99th Ave
- 14) Turn left onto SE Main St
- 15) Your destination is on the left.



Work-Related Incident Flowchart for Employees | Updated October 2016

DCS - Americas



Attachment B

AECOM SH&E Field Applicable Procedures

Cold Stress

S3AM-112-PR1

1.0 Purpose and Scope

- 1.1 To protect employees from the severest effects of cold stress (hypothermia) and cold injury and to identify exposures to cold working conditions under which it is believed nearly all employees can be repeatedly exposed without adverse health effects.
- 1.2 This procedure applies to all AECOM Americas based employees and operations working outdoors in damp and cool (below 50 degrees Fahrenheit [°F] or 10 degrees Celsius [°C]) conditions or anytime temperatures are below 32°F or 0°C.

2.0 Terms and Definitions

- 2.1 **Cold Stress** – The production of physiological effects due to cold temperatures and/or wind chill.
- 2.2 **Equivalent Chill Temperature (ECT)** – Also known as Wind Chill (see below).
- 2.3 **Frostnip** – Superficial cooling of tissues without cellular destruction.
- 2.4 **Frostbite** – Freezing of tissue, resulting in tissue destruction.
- 2.5 **Hypothermia** – Condition of reduced core body temperature to 95°F (35°C) resulting in loss of dexterity, loss of mental alertness, collapse, and possible death.
- 2.6 **Wind Chill** – The combined effect of air temperature and wind. Also expressed as "equivalent chill temperature" (ECT), wind chill is defined as heat loss resulting from the effects of air temperature and wind velocity upon exposed skin.

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-128-PR1 Medical Screening & Surveillance Program
- 3.3 S3AM-208-PR1 Personal Protective Equipment
- 3.4 S3AM-314-PR1 Working Alone
- 3.5 S3AM-315-PR1 Working On or Near Water
- 3.6 S3AM-333-PR1 Marine Safety & Vessel Operations

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Manager

- Ensuring the safety of employees on their project sites, consistent with regulatory standards.
- Implement cold stress prevention measures as applicable at each work site.
- Develop/coordinate a work-warning regimen, as applicable.
- Confirm cold stress hazard assessments/evaluations were completed for the planned activities.
- Assign employees physically capable of performing the assigned tasks. Consider acclimation to cold weather when evaluating employee capability.
- Confirm employees are properly trained to recognize the symptoms of cold stress.

4.1.2 **Safety, Health and Environment (SH&E) Manager**

- Conduct/support cold stress assessments/evaluations.
- Conduct/support incident investigations related to potential cold stress-related illnesses.
- Assist project teams develop appropriate work-warming regimens.
- Provide cold stress awareness training.

4.1.3 **Supervisor**

- Identify the tasks that may be most impacted by cold stress and communicate the hazard to the assigned employees.
- Confirm that employees have been trained on the recognition of cold stress-related illnesses.
- Confirm that adequate supplies of warm fluids/drinks are readily available to employees.
- Confirm that a warm/sheltered rest area is available, as applicable.
- Conduct cold stress monitoring, as applicable.
- Implement the work-warming regimen.
- Confirm that first aid measures are implemented once cold stress symptoms are identified.
- Confirm that employees are physically capable of performing the assigned tasks and are not in a physically compromised condition.

4.1.4 **Employee**

- Observe each other for the early symptoms of cold stress-related illnesses.
- Maintain an adequate intake of available fluids.
- Report to work in a properly rested condition.
- Report all suspected cold stress-related illnesses.

4.2 **Requirements**

- 4.2.1 Carefully plan work anticipated to be performed in cool or cold conditions. If possible, heavy work should be scheduled during the warmer parts of the day or when the wind is most calm. Include costs in project budgets for specialized equipment and supplies needed to complete the field activities.
- 4.2.2 Staff working in extreme cold (wind chill or ECT below 10°F or -12°C) shall not work alone. The Buddy System shall be utilized to keep an eye on each other and to watch for signs of cold stress. Refer to *S3AM-314-PR1 Working Alone*. Watch for symptoms and signs of hypothermia.
- 4.2.3 Monitor weather forecasts and weather conditions such as ambient temperature, wind speed, and precipitation. Use observations prior to entering and while in the field to ensure appropriate protections are in place:
- If possible, move the work to a warm location.
 - If possible and as applicable, erect shelters or screens around the work area.
 - If possible, heat the work area.
 - If possible, adjust schedule according to the cold conditions, work level and worker acclimatization.
 - Implement a work-warming regimen by taking breaks out of the cold. As applicable, consult *S3AM-112 ATT1 Temperature Thresholds* to determine wind chill and work-warming schedule.
 - Take frequent short breaks in warm dry shelters to allow your body to warm up. Limit time of exposure to the cold. If shelter is not readily available, consider supplying temporary shelters.

- Provide assistance to prevent body heat loss, such as:
 - Providing appropriate sources of heat (e.g. warm packs, portable heaters, etc.).
 - Use of insulating materials on equipment handles when temperatures drop below 30°F (-1°C).

4.2.4 All staff working in extreme cold or snow conditions should understand the following guidelines for preventing and detecting hypothermia and frostbite; refer to *S3AM-112-ATT2 Symptoms & Treatment*:

- Ensure appropriate PPE requirements are established and adhered to.
- Avoid exhaustion or fatigue because energy is needed to keep muscles warm.
- Because prolonged exposure to cold air or to immersion in cold water at temperatures even well above freezing can lead to dangerous hypothermia, whole-body protection shall be used.
- Eat high calorie snacks to help maintain body metabolism.
- Confirm extra blankets or sleeping bags are on-site.
- Drink plenty of warm liquids. It is easy to become dehydrated in cold weather.
- Avoid caffeine and alcohol, which can act as diuretics. Alcohol consumption, depending upon quantity, can dilate blood vessels enhancing body heat loss or constrict blood vessels decreasing heat delivery to extremities.
- NEVER IGNORE SHIVERING. Persistent or violent shivering is a clear warning that you are on the verge of hypothermia.
- If you experience frost bite or hypothermia, find shelter and warmth and contact a medical practitioner if symptoms persist, refer to *S3AM-128-PR1 Medical Screening & Surveillance*.

4.3 Training

Before they begin work in a cold environment, employees that might be exposed to cold stress will be informed of the potential for cold stress and how to prevent cold stress. Employees that have not had the training within the twelve prior months shall repeat the training before exposure to cold stress, refer to *S3AM-003-PR1 SH&E Training*. Employees potentially exposed to cold stress will receive training including, but not limited to:

- 4.3.1 Sources of cold stress, the influence of protective clothing, and the importance of acclimatization.
- 4.3.2 How the body loses heat.
- 4.3.3 Recognition of cold-related illness symptoms.
- 4.3.4 Cold stress preventative/corrective measures including, but not limited to:
 - Weather monitoring.
 - Proper eating and drinking practices.
 - Work-warming schedules and proper re-warming techniques.
 - Buddy system.
 - Safe cold work practices appropriate to the work that is to be performed.
 - Proper use of cold environment personal protective clothing.
- 4.3.5 The harmful effects of excessive alcohol consumption in a cold stress environment.
- 4.3.6 The hazards associated with unstable snow or ice build ups.
- 4.3.7 First aid procedures for symptoms related to cold stress.

4.4 Personal Protective Equipment (PPE)

Wearing the right clothing is crucial to avoiding cold stress. The type of fabric also makes a difference. Cotton loses its insulation value when it becomes wet. Wool, on the other hand, retains its insulation even when wet. Adequate insulating dry clothing will be required in air or wind chill temperatures below 40 °F (4.4°C)

All PPE will comply with the requirements of *S3AM-208-PR1 Personal Protective Equipment* and consider the following requirements:

- 4.4.1 Wear at least 3 layers of clothing to help prevent cold stress. It is important to preserve the air space between the body and the outer layer of clothing to retain body heat.
 - Wear a middle layer of down, wool, or similar materials to provide insulation.
 - Avoid cotton, especially blue jeans.
 - Wear an outer layer to break the wind and allow some ventilation (e.g., Gortex® or nylon)
 - Do not wear tight clothing. Loose clothing allows better ventilation.
- 4.4.2 Wear proper clothing, including head coverings and gloves or mittens for cold, wet, and windy conditions.
- 4.4.3 Wear a hat or hardhat liner. Up to 40 percent of body heat can be lost when the head is left exposed.
- 4.4.4 Use insulated footwear with adequate traction to prevent slips and falls.
- 4.4.5 Wear insulated boots or other insulated footwear, and insulated gloves to help reduce the chance of frostbite.
- 4.4.6 Keep a change of dry clothing available in case work clothes become wet.
- 4.4.7 Eye and face protection for employees employed outdoors in a snow and/or ice-covered terrain should be supplied.
 - Sunglasses (with UVA and UVB protection) and sunscreen should be used when there is a persistent combination of snow and direct sun.
 - Special safety goggles to protect against blowing ice crystals and ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision) should be required when there is an expanse of snow coverage causing a potential eye exposure hazard.
 - Ensure face guards are used to protect skin in cold, windy conditions, including riding on an unshielded vehicle.

4.5 General Cold Stress Prevention Measures

- 4.5.1 In order to prevent hypothermia:
 - Wear appropriate clothing and PPE as determined by the weather conditions.
 - When active, ventilate excess heat by opening or removing outer layers of clothing to avoid sweating.
 - Start with the mitten or gloves, unless protection from ice, snow, or cold metal surfaces is needed.
 - Next remove head gear and neck wrappings.
 - Then coats/parkas should be opened at the waist and sleeves.
 - Finally, layers of clothing should be taken off.
 - When resting or tired, or colder conditions are encountered, add additional layers of clothing/ close outer layers in the reverse of the above order, or get out of the cold. Have a sweet drink but do not indulge in heavy eating.

- Garments worn to keep out rain and spray should also allow water vapor to escape.
- Take advantage of heat from the sun and stay out of the wind as much as possible.
- Have available emergency shelter providing protection from wind and rain and insulation from the ground.
- Replace wet clothing. If wet clothing cannot be replaced, then cover it with a layer of non-breathing material to prevent evaporation. Place an insulation layer over this non-breathing material.
- Get adequate rest; conserve energy.
- Get adequate nutrition to replenish energy stores; rest after meals.
- Drink adequate fluids to avoid dehydration.
- If any project / location staff member shows signs of hypothermia, stop and treat him/her.

4.5.2 In order to prevent frost bite:

- Dress to prevent hypothermia and protect the feet and hands.
- Avoid obstruction of circulation by, for example, tight boots or tightly fitting clothing.
- Avoid nicotine (particularly cigarettes) and do not consume alcohol.
- Keep ears and nose covered and out of the wind.
- Frostbite of the corneas of the eyes can be prevented by protective goggles.
- Adopt a "buddy system" of constantly watching the faces of others in the party for white skin tissue, which is evidence of frostbite (frostnip).
- Practice constant personal vigilance for signs of trouble in one's own fingers and toes; when in doubt, investigate thoroughly before it is too late.

4.5.3 Adequate, insulating dry clothing that will help maintain core temperatures above 96.8°F (37°C) shall be provided to employees if work is performed in air temperatures below 40°F (4.4°C). Wind chill cooling rate and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required.

4.5.4 An Equivalent Chill Temperature (ECT) chart relating the actual dry bulb air temperature and the wind velocity is presented in *S3AM-112-ATT1 Temperature Thresholds*. Unless unusual or extenuating circumstances exist, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. Superficial or deep local tissue freezing will occur only at temperatures below 32°F (0°C) regardless of wind speed. However, older employees, those with circulatory problems and those with previous cold injuries require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions that should be considered.

4.5.5 Continuous exposure of skin should not be permitted when the air speed and temperature results in an ECT of -25°F (-32°C) or below.

4.5.6 At air temperatures of 40°F (4.4°C) or less, it is imperative that employees who become immersed in water or whose clothing becomes wet be immediately removed from the cold environment, provided a change of clothing, and be treated for hypothermia.

4.5.7 If the air velocity at the job site is increased by wind, draft, or artificial ventilating equipment, the cooling effect of the wind should be reduced by shielding the work area or by wearing an easily removable windbreak garment.

4.5.8 Adequate protection, such as general ventilation, shall be incorporated into any warming shelter design to prevent carbon monoxide poisoning.

- 4.5.9 Operation of internal combustion or similar devices within warming shelters is prohibited.
- 4.5.10 If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work should be modified or suspended until adequate clothing is made available or until weather conditions improve.
- 4.5.11 Walking and working surfaces shall be cleared of ice and snow to prevent slips and falls.
- 4.5.12 Confirm that employees carry fire starter materials if working in remote areas.
- 4.5.13 Supplies such as PPE, fuels, enclosures, de-icing, traction aids, warm drinks, and batteries will be specified by the SH&E Manager and/or the Manager and made available. These supplies will be inspected at least weekly during cold weather projects and replaced when necessary.
- 4.6 Cold Stress Prevention Measures for the Hands
 - 4.6.1 Special protection of the hands is required to maintain manual dexterity for the prevention of accidents including, but not limited to the following:
 - If fine work is to be performed with bare hands for more than 10 to 20 minutes in an environment below 60°F (15°C), special provisions should be established for keeping the employees' hands warm. For this purpose, warm air jets, radiant heaters (fuel burner or electric radiator), or contact warm plates may be utilized. Metal handles of tools and control bars should be covered by thermal insulating material at temperatures below 30°F (-1° C).
 - If the air temperature falls below 60°F (15°C) for sedentary work, 40°F (4.4° C) for light work, or 20°F (-6°C) for moderate work, and fine manual dexterity is not required, employees should use gloves.
 - 4.6.2 To prevent contact frostbite, employees should wear anti-contact gloves:
 - When cold surfaces below 20°F (-6°C) are within reach, each employee should be warned to prevent inadvertent contact by bare skin.
 - If the air temperature is 0°F (-18°C) or less, employees should protect their hands with mittens or appropriate gloves. Machine controls and tools for use in cold conditions should be designed so that they can be handled without removing the mittens or gloves.
 - Ensure an adequate supply of dry gloves is available to replace wet gloves.
 - 4.6.3 Provisions for additional total body protection are required if work is performed in an environment at or below 40°F (4.4°C). The employees should wear cold protective clothing appropriate for the level of cold and physical activity.
 - 4.6.4 Additional Cold Stress Prevention Measures:

For work practices at or below 10°F (-12°C) ECT, the following will apply:

 - The employee should be under constant protective observation (buddy system or supervision).
 - The work rate should not be so high as to cause heavy sweating that will result in wet clothing. If heavy work is being performed, rest periods should be taken in heated shelters and opportunities to change into dry clothing should be provided.
 - New employees should not be required to work full time in the cold during the first days of employment until they become acclimated to the working conditions and required protective clothing. Refer to *S3AM-112-ATT1 Temperature Thresholds* for guidance.
 - The weight and bulkiness of clothing should be included in estimating the required work performance and weights to be lifted by the employee.
 - The work should be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats should not be used. The employee should be protected from drafts to the greatest extent possible.

- 4.6.5 Employees handling evaporative liquid (gasoline, alcohol, or cleaning fluids) at air temperatures below 40°F should take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling. Special note should be taken of the particularly acute effects of splashes of “cryogenic fluids” or those liquids with a boiling point that is just above ambient temperature.
- 4.6.6 Trauma sustained in freezing or subzero conditions requires special attention, because an injured employee is predisposed to cold injury. Special provisions should be made to prevent hypothermia and freezing of damaged tissue in addition to providing for first aid treatment.

4.7 Hypothermia in Water

- 4.7.1 Loss of body heat to the water is a major cause of deaths in boating and working near water incidents. Often the cause of death is listed as drowning; however, the primary cause is often hypothermia. It should also be noted that alcohol lowers the body temperature around 2 to 3 degrees by dilating the blood vessels. Do not drink alcohol around cold water. The following table shows the effects of hypothermia in water:

WATER TEMPERATURE	EXHAUSTION	SURVIVAL TIME
32.5°F (0°C)	Under 15 minutes	Under 15 to 45 minutes
32.5 to 40°F (0 to 4°C)	15 to 30 minutes	30 to 90 minutes
40 to 50°F (4 to 10°C)	30 to 60 minutes	1 to 3 hours
50 to 60°F (10 to 16°C)	1 to 2 hours	1 to 6 hours
60 to 70°F (16 to 21°C)	2 to 7 hours	2 to 40 hours
70 to 80°F (21 to 27°C)	3 to 12 hours	3 hours to indefinite
Over 80°F (27°C)	Indefinite	Indefinite

- 4.7.2 Some points to remember when water is a potential hazard:

- Wear a personal flotation device when drowning is a potential hazard. Refer to *S3AM-315-PR1 Working On or Near Water*, and *S3AM-333-PR1 Marine Safety & Vessel Operations*.
- If the water is less than 50°F (10°C), wear a wet suit or dry suit for work in water (e.g., wading, or if a significant potential to fall in water exists).
- While in the water, do not attempt to swim unless to reach nearby safety. Unnecessary swimming increases the rate of body heat loss. Keep the head out of the water. This will increase survival time.
- Keep a positive attitude about rescue. This will increase chances of survival.
- If there is more than one person in the water, huddling is recommended to conserve body heat.

- 4.7.3 If an employee or equipment is to work on ice and the water beneath the ice is or may be more than 3¼ feet (1m) deep at any point:

- Test the ice prior to commencing to ensure it will support the load to be placed on it. Ongoing testing may be necessary.
- If there is any risk of falling through the ice employees must wear personal protective equipment that will ensure buoyancy and protect against hypothermia at all times while on the ice.

4.8 Work-Warming Regimen

- 4.8.1 If work is performed continuously in the cold at an equivalent chill temperature (ECT) at or below 19°F (−7°C), heated warming shelters (tents, cabins, rest rooms, etc.) should be made available nearby. The employees should be encouraged to use these shelters at regular intervals; the frequency will depend on the severity of the environmental exposure. Refer to *S3AM-112-ATT1 Temperature Thresholds* for guidance.

- 4.8.2 The onset of heavy shivering, minor frostbite (frostnip), the feeling of excessive fatigue, drowsiness, irritability, or euphoria are indications for immediate return to the shelter.
- 4.8.3 When entering the heated shelter, the outer layer of clothing should be removed and the remainder of the clothing should be loosened to permit sweat evaporation or a change of dry work clothing provided.
- 4.8.4 A change of dry work clothing should be provided as necessary to prevent employees from returning to the cold environment with wet clothing.

5.0 Records

- 5.1 Exposure assessments will be documented in the location's files.

6.0 Attachments

- 6.1 [S3AM-112-ATT1 Temperature Thresholds](#)
- 6.2 [S3AM-112-ATT2 Symptoms & Treatment](#)

Cranes & Lifting Devices

S3AM-310-PR1

1.0 Purpose and Scope

- 1.1 This procedure establishes the minimum requirements for rigging, hoisting, and crane operations.
- 1.2 This procedure is intended to establish general practices for the operation and maintenance of cranes, other lifting devices and rigging equipment in order to minimize the potential for personal injury and property damage. These general practices shall be supplemented by applicable regulatory requirements, and any practices, procedures, and/or operational requirements outlined by the crane, lifting device or rigging equipment manufacturer.
- 1.3 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

Refer to *S3AM-310-ATT1 Definitions* for a more comprehensive list.

- 2.1 **ASM** – American Society of Mechanical Engineers
- 2.2 **Assembly/Disassembly (A/D) Director** – An individual who meets this subpart's requirements for an A/D Director, irrespective of the person's formal job title or whether the person is non-management or management personnel. A/D will be directed by a person who meets the criteria for both a competent person and a qualified person or by a competent person who is assisted by one or more qualified persons. If the assembly/disassembly is being performed by only one person, that person will meet the criteria for both a competent person and a qualified person. For purposes of this standard, that person is considered the A/D Director.
- 2.3 **Controlling Entity** – An employer that is a prime contractor, general contractor, construction manager, constructor or any other legal entity that has the overall responsibility for the construction of the project, including planning, quality, safety and completion.
- 2.4 **Crane** – Any power-operated equipment that can hoist, lower, and horizontally move a suspended load.
- 2.5 **Critical lifts** – Loads classified as requiring a formal, written plan. A critical lift plan is defined as a non-routine crane lift requiring detailed planning and additional or unusual safety precautions. Critical lifts include:
 - Lifts made when the load is greater than 75 percent of the rated capacity of the crane in the configuration that the lift will be made;
 - Lifts that require the load to be lifted, swung, or placed out of the operator's view;
 - Lifts made with more than one crane or hoisting device;
 - Lifts involving non-routine or technically difficult rigging arrangements;
 - Lifts of long lead time permanent materials;
 - Lifts that involve lifting loads over structures or equipment;
 - Lifts taking place in a confined or limited access areas;
 - Hoisting personnel with a crane or derrick; or
 - Any lift which the lift supervisor, operator, or other management personnel believes should be considered critical.

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training

- 3.2 S3AM-202-PR1 Competent Person Designation
- 3.3 S3AM-208-PR1 Personal Protective Equipment
- 3.4 S3AM 209 PR1 Risk Assessment & Management
- 3.5 S3AM-304-PR1 Fall Protection
- 3.6 S3AM-309-PR1 Heavy Equipment
- 3.7 S3AM-322-PR1 Overhead Lines
- 3.8 S3AM-323-PR1 Aerial Work Platforms

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Manager (includes Supervisors)

- Responsible for confirming that all aspects of this procedure are followed and adhered to by all AECOM personnel.
- Confirm appropriate training of personnel to be involved in lifting operations.
- Confirm all necessary information is communicated to all personnel involved or affected.
- Confirm all applicable documentation is completed prior to applicable tasks commencing.
- Participate in the approval of the Critical Lift Plan.

4.1.2 Safety, Health and Environment (SH&E) Manager

- Establishing requirements regarding compliance with applicable jurisdictional safety regulations and communicating these requirements to AECOM management.
- Participate in the approval of the Critical Lift Plan.
- Assist as required, in any inspections, audits or investigations.

4.1.3 Competent Person

- Confirm appropriate training and experience to be designated a competent person. Refer to *S3AM-202-PR1 Competent Person Designation*.
- Perform inspections of cranes, lifting equipment, and rigging as required.
- Identify and assess risk associated with hazards (e.g. wind, suspended loads, workers entering lift zone, etc.) in order to determine appropriate action.
- Conduct and/or supervise load tests as required.
- Supervise the crane or lifting device operation.
- Determine if it is necessary to reduce rated capacity, and determine appropriate load position, boom location, ground support, travel route, distance from overhead obstructions, and speed of movement necessary to ensure safety.

4.1.4 Crane Operator

- Maintain appropriate training / certification / license (as required) by the appropriate regulatory authority. Documentation of certification must be carried by the operator while operating a crane.

- Have practical experience and technical knowledge of pre-operation checks, operator controls, engine start-up, computer set-up and checks, crane operation, inspection, maintenance, characteristics, limitations, and post operation checks on specific cranes
- Be completely familiar with and operate the crane according to the crane's operating manual and load chart. The operator must understand the correct meaning of all notes and be capable of calculating the crane's net capacity under all possible conditions and for every possible configuration of the machine
- Inspect the crane as prescribed by both regulation and the manufacturer.
- Be able to communicate when signals and instructions are given by radio or hand. If any signals are not understood or communication disrupted, the operator shall stop all crane movement.
- Approve the Lift Classification and, as applicable, the Critical Lift Plan and Personnel Platform Lifting form.

4.2 General Requirements

4.2.1 Planning is the key to successful and safe hoisting operations and the prevention of accidents and incidents. Proper planning includes, at a minimum:

- Industrial site or project specific SH&E Plan. Refer to *S3AM-209-PR1 Risk Assessment & Management*.
- Verification of training appropriate to employee's roles in the lift.
 - Managers will confirm that crane operators, signal persons, and riggers are certified/qualified.
 - AECOM personnel will not operate powered cranes without direct approval from the Manager, and SH&E Manager.
- Development of a Task Hazard Assessment (THA) for each of the tasks to be performed during each lift.
- As applicable, assessing ground conditions, weather conditions and power line safety in the lift pre-planning.
- Properly classifying the lift. Complete *S3AM-310-FM2 Lift Classification*, or equivalent, to determine the type of lift to be conducted.
 - This includes correctly identifying when a lift is considered "critical," as defined by this procedure.
 - Preparation for critical lifts shall include completing *S3AM-310-FM3 Critical Lift Plan* or equivalent.
 - If the critical lift involves lifting of personnel, *S3AM-310-FM11 Personnel Platform Lifting* or equivalent shall be completed.
- The results of hazard assessments, required permits, any additional procedures and documentation (e.g. boom truck checklist, engineered lift plan, etc.) associated with the work and the proposed lift shall be communicated to those who will be involved (including client representatives) during the regular tailgate meeting and/or a pre-lift meeting.
- Concerning worksites in which other employers control concurrent operations and SH&E issues related to the worksite, the Manager shall coordinate with the Controlling Entity and/or those conducting concurrent operations to confirm appropriate control measures are in place to protect employees from the hazards associated with activities to be performed.

- Coordination shall occur prior to work commencing, periodically thereafter, and as necessary given changes in scope and/or working conditions.
 - Affected employees (including managers and supervisors) shall seek to participate in all site SH&E meetings related to concurrent operations.
- 4.2.2 Cranes and lifting devices shall be designed, constructed and tested in accordance with the standards applicable to the given jurisdiction (e.g. ASME, CSA).
- 4.2.3 Cranes and lifting devices shall be inspected and maintained according to manufacturer and regulatory specifications.
 - Any deficiencies or unsafe conditions identified in an inspection shall be solved (repaired, altered, replaced) and appropriately verified as safe for operation before the hoisting equipment is placed in service.
 - Personnel conducting repairs or alterations shall be qualified to repair or alter the specific equipment.
 - The equipment's logbook shall be completed and reflect any inspections, repairs, testing and maintenance completed.
 - The equipment owner or the party responsible for the operation of the equipment shall confirm that an up to date logbook is maintained and readily available for review by the operator or any person requiring maintenance information on the equipment.
- 4.2.4 Work area
 - The passing of loads over client facility equipment, trailers, public roads, and sidewalks shall only be done if the necessary precautions have been taken for the safety of all workers and other persons.
 - When operating conditions are such that the boom of the crane swings over property lines or operating transportation systems, the owners of adjacent properties or systems shall be consulted. A diagram should be prepared detailing the proposed swing paths for the crane.
 - Work area control. Prior to equipment operation, the manager (or his/her designee) shall either:
 - Erect and maintain control lines, warning lines, railings, or similar barriers to mark the boundaries of the hazard areas (lift zone, swing radius, path of travel, landing zone, etc.); or
 - The hazard areas shall be clearly marked by a combination of warning signs and high-visibility markings on the equipment that identify the hazard areas. In addition, the manager (or his/her designee) shall train the workers to understand what these markings signify.
- 4.2.5 The operator shall know total weight of every load being lifted, operating radius for lift as well as the maximum lift height and final position of the load.
- 4.2.6 Confirm the lifting equipment and rigging capacities are not exceeded.
- 4.2.7 All hooks on hoisting equipment shall be equipped with safety hooks.
- 4.2.8 All rigging shall be properly maintained and stored according to manufacturer's specifications.
 - Inspect all rigging to be used (i.e. hooks, wire rope, chains, slings, etc.) for deficiencies (i.e. bird-caging, broken wires, abrasion, cuts, nicks, bent links, bent hooks, etc.), before each use and at appropriate intervals.
 - Deficient equipment shall be removed from service, tagged out and/or reuse prevented (e.g. slings cut). If in doubt, do not use. Refer to *S3AM-310-ATT3 Rigging*.

- 4.2.9 Only loads that have been properly rigged or have been placed in containers designed for hoisting may be lifted.
 - 4.2.10 Loads should only be rigged for hoisting by qualified persons.
 - 4.2.11 Determine the center of gravity or point of balance. All loads shall be freely suspended over the load's center of gravity and clear to lift, avoiding any possible shock or impact load, as well as any obstructions or boom clearance concerns.
 - 4.2.12 Utilize taglines to control load movement:
 - If tagline usage poses a safety hazard this shall be reflected in the planned procedure and the task hazard assessment, and a short line of suitable length shall be attached to allow the worker to catch the load.
 - If electrical hazards are present the tag line shall be non-conductive.
 - 4.2.13 Watch for the roll or swing of the load:
 - As immediate correct identification of center of gravity may not be possible, swing or roll of the load due to the load line not positioned directly above center of gravity may occur.
 - Anticipate the direction of the swing or roll and work away from it.
 - 4.2.14 Confirm body is never placed between material, equipment or any stationary object and the load swing. Stay away from stacked material that may be knocked over by a swinging load.
 - 4.2.15 Confirm all personnel stand clear from the load being lifted and the path of travel or swing path. Utilize suitable signage and/or barricading.
 - 4.2.16 Loads shall not pass over personnel, occupied buildings or critical operating facilities.
 - 4.2.17 Look over the area where the load is to be positioned. Remove unnecessary blocks or other objects that might fly up if struck by the load.
 - 4.2.18 Never leave a load suspended when the lifting device or crane is unattended.
 - 4.2.19 Never permit anyone to ride the lifting hook or the load.
 - 4.2.20 When lowering or setting the load, be sure feet and all other body parts are out from under the load.
 - Set the load down easily and slowly.
 - All loads transported by sling shall be grounded and/or cables touch the ground prior to personnel contacting the rigging. This is to prevent a discharge of electrical current that can generate during transport. Under some conditions the current can arc up to 8 inches (20 centimeters).
 - Confirm load will not shift before removing rigging.
 - Loose loads will be blocked before unhooking.
- 4.3 Ground Conditions
- 4.3.1 This section does not apply to side-boom cranes.
 - 4.3.2 Do not assemble or use lifting devices or cranes unless ground conditions are firm, drained (except for marshes/wetlands), and graded to a sufficient extent that, in conjunction with the use of supporting materials (if necessary), the equipment manufacturer's specifications for adequate support and degree of equipment level are met.
 - 4.3.3 Controlling entity means a prime contractor, general contractor, or construction manager, or any other legal entity having the overall planning, quality, and completion responsibility for the construction of the project. The controlling entity shall:

- Confirm that ground preparations necessary to meet the requirements in 4.3.1 of this section are provided.
 - Inform the user of the equipment and the operator of the location of hazards beneath the equipment set-up area (such as voids, tanks, utilities) that are identified in documents (such as site drawings, as-built drawings, and soil analyses) if they are available to the controlling entity.
- 4.3.4 If the assembly/disassembly (A/D) supervisor determines that ground conditions do not meet the requirements for safe lifting, that applicable manager (or his/her designee) shall notify the controlling entity regarding the ground preparations that are needed.
- 4.4 Crane Inspection
- 4.4.1 Initial & Annual (Comprehensive)
- Prior to using any cranes, and at least every 12 months thereafter, an Initial/Annual Inspection and a Crane Load Test shall be conducted on such equipment.
 - *S3AM-310-FM1 Initial & Annual Crane Inspection* or equivalent shall be completed.
 - All initial and annual crane inspections shall be carried out by a Professional Engineer licensed to practice in the jurisdiction, or where applicable by legislation, by a qualified person designated by the Engineer. .
 - Identified deficiencies shall be corrected and inspected by the professional engineer or qualified person.
 - Cranes involved in misadventure (i.e. shock load, electrical contact, etc.) that results in suspicion of potential or actual damage shall undergo a comprehensive inspection by a professional engineer or, as permitted by the applicable jurisdiction, a qualified person, and be verified as safe for operation prior to use.
 - Cranes that have been idle for 3 months or more shall be inspected by a qualified person using *S3AM-310-FM1 Initial & Annual Crane Inspection* or equivalent.
 - No crane shall be put into use before an inspection has been completed and absence of defects or hazards has been verified.
- 4.4.2 Modified Equipment
- Lifting devices and cranes that have modifications or additions that affect the safe operation of the equipment (such as modifications or additions involving a safety device or operator aid, critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism) or capacity shall be inspected by a qualified person (e.g. professional engineer) after such modifications/additions have been completed and prior to initial use. The inspection shall meet the following requirements:
 - Confirm that modifications or additions have been done in accordance with the approval obtained.
 - Prior to initial use, and under the direction of a qualified person, load-test all lifting devices and cranes in which load-sustaining parts have been altered, replaced, or repaired. The replacement of wire rope is specifically excluded from this requirement; however, a functional test of the crane under a normal operating load will be made prior to putting a crane back into service.
- 4.4.3 Repaired or Adjusted Equipment
- Lifting devices and cranes that have had a repair or adjustment relating to safe operation (such as a repair or adjustment to a safety device or operator aid, or to a critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism) shall be inspected by a qualified person after such a repair or

adjustment has been completed, prior to initial use. The inspection shall meet the following requirements:

- The qualified person will determine if the repair/adjustment meets manufacturer's equipment criteria.
- Prior to use after repair or adjustment of equipment, all lifting devices and cranes in which load-sustaining parts have been altered, replaced, or repaired shall be load-tested by, or under the direction of, a qualified person. The replacement of wire rope is specifically excluded from this requirement; however, a functional test of the crane under a normal operating load will be made prior to putting a crane back into service.

4.4.4 Post-Assembly

- Upon completion of assembly, the equipment shall be inspected by a qualified person to assure that it is configured in accordance with the manufacturer's equipment criteria.
- Do not use equipment until an inspection under this paragraph demonstrates that the equipment is configured in accordance with the applicable criteria.

4.4.5 Each Shift (Daily)

- A competent person shall begin a visual inspection prior to each shift or operation.
- Document using *S3AM-310-FM4 Daily Crane Inspection*, or equivalent, to provide adequate documentation of the inspection. The inspection will consist of observation for apparent deficiencies.
- Disassembly is not required as part of this inspection unless the results of the visual inspection or trial operation indicate that further investigation necessitating disassembly is needed.
- Determinations made in conducting the inspection will be reassessed in light of observations made during operation.

4.4.6 Monthly

- Each month the crane is in service, it shall be inspected by a qualified person using *S3AM-310-FM5 Monthly Crane Inspection*, or equivalent.
- Equipment shall not be used until an inspection under this paragraph demonstrates that no deficiencies are found.

4.4.7 Any part of the manufacturer's procedures regarding inspections relating to safe operation (e.g. safety device or operator aid, critical part of a control system, load-sustaining structural components, load hook, or in-use operating mechanism) that is more comprehensive or has a more frequent schedule than the requirements of this section will be followed.

4.4.8 Documentation

- Maintain all inspection forms on file at the job site for review by interested parties for the duration of the project.

4.5 Wire Rope Inspection

4.5.1 Shift Inspection

- A competent person will conduct a visual inspection of wire ropes prior to each shift. They will observe wire ropes (running and standing) that are reasonably likely to be used during the shift for apparent deficiencies, including those listed below. Untwisting (opening) of wire rope or booming down is not required as part of this inspection.
- Apparent Deficiencies
 - Category I

- Significant distortion of the wire rope structure such as kinking, crushing, unstranding, bird caging, signs of core failure, or steel core protrusion between the outer strands.
- Significant corrosion.
- Electric arc (from a source other than power lines) or heat damage.
- Improperly applied end connections.
- Significantly corroded, cracked, bent, or worn end connections (such as from severe service).
- Category II
 - Visible broken wires, as follows:
 - a. In running wire ropes: Six randomly distributed broken wires in one rope lay, or three broken wire in one strand in one rope lay, where a rope lay is the length along the rope in which one strand makes a complete revolution around the rope.
 - b. In rotation-resistant ropes: Two randomly distributed broken wires in six rope diameters, or four randomly distributed broken wires in 30 rope diameters.
 - c. In pendants or standing wire ropes: More than two broken wires in one rope lay located in rope beyond end connections, and/or more than one broken wire in a rope.
 - A diameter reduction of more than 5 percent from nominal diameter.
- Category III
 - In rotation-resistant wire rope, core protrusion or other distortion indicating core failure.
 - Electrical contact with a power line.
 - A broken strand
- Critical review items. The competent person will pay particular attention to:
 - Rotation-resistant wire rope in use.
 - Wire rope being used for boom hoists and luffing hoists, particularly at reverse bends.
 - Wire rope at flange points, crossover points, and repetitive pickup points on drums.
 - Wire rope adjacent to end connections.
 - Wire rope at, and on, equalizer sheaves.
- Removal from service
 - If a deficiency in Category I is identified, an immediate determination will be made by the competent person as to whether the deficiency constitutes a safety hazard. If the deficiency is determined to constitute a safety hazard, operations involving use of the wire rope in question will be prohibited until:
 - The wire rope is replaced; or
 - If the deficiency (other than power line contact) is localized, the problem is corrected by severing the wire rope in two: the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited. Repair of wire rope that contacted an energized power line is also prohibited.
 - If a deficiency in Category II is identified, the manager (or his/her designee) will comply with Option A or Option B, as follows:

- Option A. Consider the deficiency to constitute a safety hazard where it meets the wire rope manufacturer's established criterion for removal from service, or meets a different criterion that the wire rope manufacturer has approved in writing for that specific wire rope. If the deficiency is considered a safety hazard, operations involving use of the wire rope in question will be prohibited until the wire rope is replaced; or
- Option B. If the deficiency is localized, the problem is corrected by severing the wire rope in two: the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited.
- If a deficiency in Category III is identified, operations involving use of the wire rope in question will be prohibited until:
 - The wire rope is replaced; or
 - If the deficiency (other than power line contact) is localized, the problem is corrected by severing the wire rope in two: the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited. Repair of wire rope that contacted an energized power line is also prohibited.
- Where a wire rope is required to be removed from service under this section, either the equipment (as a whole) or the hoist with that wire rope will be tagged-out, in accordance with this procedure, until the wire rope is repaired or replaced

4.5.2 Monthly Wire Rope Inspection

- Each month a wire rope inspection will be conducted in accordance with the monthly crane inspection. Document the inspection using *S3AM-310-FM6 Wire Rope & Hook Inspection*, or equivalent.
- In addition, at least every 12 months, the wire ropes in use on equipment will be inspected by a qualified person for the types of deficiencies listed below.
 - The inspection will be complete and thorough, covering the surface of the entire length of the wire ropes, with particular attention given to:
 - Categories I, II, and III and critical review items.
 - Those sections that are normally hidden during shift and monthly inspections.
 - Wire rope in contact with saddles, equalizer sheaves, or other sheaves where rope travel is limited.
 - Wire rope subject to reverse bends.
 - Wire rope passing over sheaves.
 - Wire rope at or near terminal ends.
 - In the event a 12-month inspection is not feasible due to existing set-up and configuration of the equipment (such as where an assist crane is needed) or due to site conditions (such as a dense urban setting), such inspections will be conducted as soon as they becomes feasible, but no longer than an additional 6 months for running ropes; and for standing ropes, at the time of disassembly.
- If a deficiency is identified, an immediate determination will be made by the qualified person as to whether the deficiency constitutes a safety hazard.
 - If the deficiency is determined to constitute a safety hazard, operations involving use of the wire rope in question will be prohibited until:
 - The wire rope is replaced; or

- If the deficiency is localized, the problem is corrected by severing the wire rope in two: the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited.
- If the qualified person determines that, although not currently a safety hazard, the deficiency needs to be monitored, the manager (or his/her designee) shall confirm that the deficiency is checked in the monthly inspections.
- The inspection shall be documented in accordance with this procedure.

4.5.3 Do not use rope lubricants that are of the type that hinder inspection.

4.6 Wire Rope – Selection and Installation Criteria

4.6.1 Select replacement wire rope in accordance with the requirements of this section, and the recommendations of the wire rope manufacturer, the equipment manufacturer, or a qualified person.

4.6.2 Boom-hoist reeving

- Do not use fiber core ropes for boom-hoist reeving, except for derricks.
- Use rotation-resistant ropes for boom-hoist reeving only where the requirements of 4.6.3 below are met.

4.6.3 Rotation-resistant ropes

- Definitions
 - Type I rotation-resistant rope is stranded rope constructed to have little or no tendency to rotate; or, if guided, transmits little or no torque. It has at least 15 outer strands and comprises an assembly of at least three layers of strands laid helically over a center in two operations. The direction of lay of the outer strands is opposite to that of the underlying layer.
 - Type II rotation-resistant rope is stranded rope constructed to have significant resistance to rotation. It has at least 10 outer strands and comprises an assembly of two or more layers of strands laid helically over a center in two or three operations. The direction of lay of the outer strands is opposite to that of the underlying lay.
- Requirements
 - Do not use Types II and III with an operating design factor of less than five for duty cycle or repetitive lifts.
 - Use rotation-resistant ropes (including Types I, II, and III) with an operating design factor of no less than 3.5.
 - Type I shall have an operating design factor of no less than five, except where the wire rope manufacturer and the equipment manufacturer approves the design factor, in writing.
 - Types II and III shall have an operating design factor of no less than five, except where the requirements of this section are met, as listed below.
- When Types II and III with an operating design factor of less than five are used (for non-duty cycle, non-repetitive lifts), the following requirements shall be met for each lifting operation:
 - A qualified person shall inspect the rope in accordance with this procedure. The rope may be used only if the qualified person determines that there are no deficiencies constituting a hazard. In making this determination, more than one broken wire in any one rope lay will be considered a hazard.
 - Conduct operations in such a manner and at such speeds as to minimize dynamic effects.

- Each lift made under these provisions will be recorded in the monthly and annual inspection documents. Such prior uses will be considered by the qualified person in determining whether to use the rope again.
 - Additional requirements
 - Do not use rotation-resistant ropes for boom-hoist reeving, except where the requirements of this section are met, as listed below.
 - Rotation-resistant ropes may be used as boom-hoist reeving when load hoists are used as boom hoists for attachments such as luffing attachments or boom and mast attachment systems. Under these conditions, the following requirements shall be met:
 - The drum shall provide a first-layer rope-pitch diameter of not less than 18 times the nominal diameter of the rope used.
 - The requirements in this standard (regardless of the date of manufacture of the equipment).
 - The requirements in ASME B30.5-2007, Section 5-1.3.2(a), (a)(2) through (a)(4), (b) and (d), except that the minimum pitch diameter for sheaves used in multiple-rope reeving is 18 times the nominal diameter of the rope used, instead of the value of 16 specified in Section 5-1.3.2(d).
 - All sheaves used in the boom-hoist reeving system shall have a rope-pitch diameter of not less than 18 times the nominal diameter of the rope used.
 - The operating design factor for the boom-hoist reeving system cannot be less than 5.
 - The operating design factor for these ropes will be the total minimum breaking force of all parts of rope in the system divided by the load imposed on the rope system when supporting the static weights of the structure, and the load within the equipment's rated capacity.
 - When provided, a power-controlled lowering system shall be capable of handling rated capacities and speeds as specified by the manufacturer.
- 4.6.4 Socketing will be done in the manner specified by the manufacturer of the wire rope or fitting.
- 4.6.5 Prior to cutting a wire rope, place seizings on each side of the point to be cut. The length and number of seizings will be in accordance with the wire-rope manufacturer's instructions.
- 4.7 Safety Devices
- 4.7.1 This section does not apply to side-boom cranes.
- 4.7.2 The following safety devices are required on all equipment covered by this procedure, unless otherwise specified:
- Crane-level indicator
 - The equipment will have a crane-level indicator that is either built into the equipment or is available on the equipment.
 - If a built-in crane-level indicator is not working properly, it will be tagged-out or removed.
 - This requirement does not apply to portal cranes, derricks, floating cranes/derricks, and land cranes/derricks on barges, pontoons, vessels, or other means of flotation
 - Boom stops, except for derricks and hydraulic booms.
 - Jib stops (if jib is attached), except for derricks.
 - Equipment with foot-pedal brakes will have locks, except for portal cranes and floating cranes.

- Hydraulic outrigger jacks will have an integral holding device/check valve.
- Equipment on rails will have rail clamps and rail stops, except for portal cranes.

4.7.3 Proper Operation Required

- Operations may not begin unless the devices listed in this section are in proper working order. If a device stops working properly during operations, the operator will safely stop operations. Do not resume operations until the device is working properly. Alternative measures are not permitted to be used.

4.8 Operational Aids for Mobile and Locomotive Cranes

4.8.1 This section does not apply to side-boom cranes.

4.8.2 Consult standards and regulations for the given jurisdiction for any applicable requirements concerning operational aids, including but not limited to:

- Two-blocking features
- Load indicators, rated capacity indicators, and rated capacity limiters
- Boom angle or radius indicator
- Boom-hoist disconnect, shut-off, or hydraulic relief
- Boom-length indicator
- Crane-level indicator
- Drum-rotation indicator.

4.9 Operational Aids for Tower Cranes

4.9.1 Do not begin operations unless the operational aids are in proper working order, except where the manager (or his/her designee) meets the specified temporary alternative measures. Follow more protective alternative measures specified by the tower crane manufacturer, if any.

4.9.2 If an operational aid stops working properly during operations, the operator will safely stop operations until the temporary alternative measures are implemented or the device is again working properly. If a replacement part is no longer available, the use of a substitute device that performs the same type of function is permitted, and is not considered a modification under this procedure.

4.9.3 Category I operational aids and alternative measures. Operational aids listed in this paragraph that are not working properly shall be repaired no later than 7 days after the deficiency occurs. Exception: If the manager (or his/her designee) documents that he/she has ordered the necessary parts within 7 days of the occurrence of the deficiency, the repair will be completed within 7 days of receipt of the parts.

- Trolley-travel-limiting device. Restrict the travel of the trolley at both ends of the jib by a trolley-travel-limiting device to prevent the trolley from running into the trolley end-stops. Temporary alternative measures:
 - Option A. Mark the trolley rope (so it can be seen by the operator) at a point that will give the operator sufficient time to stop the trolley prior to the end-stops.
 - Option B. Use a spotter when operations are conducted within 10 feet (3 meters) of the outer or inner trolley end-stops.
- Boom-hoist-limiting device. Limit the range of the boom at the minimum and maximum radius. Temporary alternative measures: Clearly mark the cable (so it can be seen by the operator) at a point that will give the operator sufficient time to stop the boom within the minimum and maximum boom radius, or use a spotter.

- Anti-two-blocking device. Equip the tower crane with a device that automatically prevents damage from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component). The device(s) shall prevent such damage at all points where two-blocking could occur. As a temporary alternative, measure and clearly mark the cable so it can be seen by the operator at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking; or use a spotter.
- Hoist-drum-lower-limiting device. Equip tower cranes manufactured more than 1 year after the effective date of this procedure with a device that prevents the last two wraps of hoist cable from being spooled off the drum (consult jurisdictional requirements 5 wraps is not uncommon). As a temporary alternative measure, clearly mark the cable so it can be seen by the operator at a point that will give the operator sufficient time to stop the hoist prior to the last two wraps of hoist cable being spooled off the drum, or use a spotter.
- Load-moment-limiting device. Provide the tower crane with a device that prevents moment overloading. As a temporary alternative measure, use a radius-indicating device (if the tower crane is not equipped with a radius-indicating device, measure the radius to confirm the load is within the rated capacity of the crane). In addition, determine the weight of the load from a reliable source such as the load's manufacturer, by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per-foot weight, or by other equally reliable means. Provide this information to the operator prior to the lift.
- Hoist-line pull-limiting device. Limit the capacity of the hoist to prevent overloading, including each individual gear ratio if equipped with a multiple-speed hoist transmission. As a temporary alternative measure, the operator will confirm that the weight of the load does not exceed the capacity of the hoist (including for each individual gear ratio if equipped with a multiple-speed hoist transmission).
- Rail-travel-limiting device. Limit the travel distance in each direction to prevent the travel bogies from running into the end stops or buffers. As a temporary alternative measure, use a spotter when operations are conducted within 10 feet of either end of the travel rail end stops.
- Boom-hoist-drum positive locking device. Equip the boom-hoist drum with a device to positively lock the boom-hoist drum. As a temporary alternative measure, manually set the device when required if an electric, hydraulic, or automatic type is not functioning.

4.9.4 Category II operational aids and alternative measures. Repair operational aids listed in this paragraph that are not working properly no later than 30 days after the deficiency occurs. Exception: If the manager (or his/her designee) documents that he/she has ordered the necessary part within 7 days of the occurrence of the deficiency, and the part is not received in time to complete the repair in 30 days, complete the repair within 7 days of receipt of the parts.

- Boom-angle or hook-radius indicator.
 - Confirm luffing boom-tower cranes have a boom-angle indicator readable from the operator's station.
 - Confirm hammerhead tower cranes manufactured more than 1 year after the effective date of this subpart have a hook-radius indicator readable from the operator's station.
 - Temporary alternative measure: Determine hook radii or boom angle by measuring the hook radii or boom angle with a measuring device.
- Trolley-travel deceleration device. The trolley speed will be automatically reduced prior to the trolley reaching the end limit in both directions. Temporary alternative measure: the operator will reduce the trolley speed when approaching the trolley end limits.
- Boom-hoist deceleration device. The boom speed will be automatically reduced prior to the boom reaching the minimum or maximum radius limit. Temporary alternative measure: the operator will reduce the boom speed when approaching the boom maximum or minimum end

limits.

- Load-hoist deceleration device. The load speed will be automatically reduced prior to the hoist reaching the upper limit. Temporary alternative measure: the operator will reduce the hoist speed when approaching the upper limit.
- Wind-speed indicator. Provide a device to display the wind speed, and mount above the upper rotating structure on tower cranes. On self-erecting cranes, mount at or above the jib level. Temporary alternative measure: use wind-speed information from a properly functioning indicating device on another tower crane on the same site; or have a qualified person estimate the wind speed.
- Load-indicating device. Cranes manufactured more than 1 year after the effective date of this procedure shall have a device that displays the magnitude of the load on the hook. Displays that are part of load-moment-limiting devices that display the load on the hook meet this requirement.
- Temporary alternative measures: Determine the weight of the load from a reliable source (such as the load's manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per-foot weight); or by other equally reliable means. Provide this information to the operator prior to the lift.

4.10 Crane Operator Qualifications

4.10.1 This section does not apply to side-boom cranes.

4.10.2 Operators of cranes shall hold a valid certification or license for the equipment operation (Crane and Hoist Equipment) issued by an accredited testing organization, a government licensing entity or an apprenticeship and accredited testing organization, as required by the appropriate jurisdictional regulatory body.

- Requirements for obtaining the applicable jurisdiction's license or certification shall include assessment, by written and practical tests, of the operator's ability and knowledge, including, but not limited to:
 - The controls and operational/performance characteristics.
 - Use of, and the ability to calculate (manually or with a calculator), load/capacity information on a variety of configurations of the equipment.
 - Procedures for preventing and responding to power line contact.
 - Technical knowledge applicable to the specific type of equipment the individual will operate.
 - Technical knowledge applicable to:
 - The suitability of the supporting ground and surface to handle expected loads.
 - Site hazards.
 - Site access.
 - Ability to recognize, from visual and audible observation, the items listed in shift inspection.
 - Operational and maneuvering skills.
 - Application of load chart information.
 - Application of safe shut-down and securing procedures.
- Licensing or certification shall be renewed as specified by the applicable jurisdiction and licensing/certifying body.

- Appropriate legislation and apprenticeship boards shall be consulted to confirm compliance.
- 4.10.3 NOTE: If certification is not required and not available for a given jurisdiction for the equipment to be operated, verification of operator competency shall be documented (e.g. dependent upon jurisdiction: Boom Truck with lifting capacity less than 4.5 tonne (5 ton), Side Boom, etc.)
- 4.10.4 Apprentice operators/operators in training shall be registered, if applicable, with a recognized apprenticeship and accredited testing organization applicable to the jurisdiction in which the work is being conducted.
- Exemptions and subsequent requirements may apply.
 - Appropriate legislation, apprenticeship boards and or accredited testing organizations shall be consulted to confirm compliance.
 - Apprentice operators/operators in training shall work under the direct supervision of an authorized, competent certified crane operator. AECOM managers shall confirm the authorized worker performing direct supervision is competent, well trained in the operation of the particular lifting device, certified and capable of performing the required work.
 - For equipment other than tower cranes, the authorized worker performing direct supervision and the trainee/apprentice shall be in direct line of sight of each other, and will communicate verbally or by hand signals. For tower cranes, the authorized worker and the trainee/apprentice will be in direct communication with each other.
 - The trainee/apprentice shall be supervised by the operator's supervisor at all times, except for short breaks where the following are met:
 - The break lasts no longer than 15 minutes and there is no more than 1 break per hour.
 - Immediately prior to the break, the authorized worker performing direct supervision informs the trainee/apprentice of the specific tasks that the trainee/apprentice is to perform, and limitations that he/she is to adhere to during the authorized worker's break.
 - The specific tasks that the trainee/apprentice will perform during the authorized worker's break are within the trainee/apprentice's abilities.
 - The trainee/apprentice may not operate the equipment in any of the following circumstances:
 - If any part of the equipment, load line, or load (including rigging and lifting accessories), if operated up to the equipment's maximum working radius in the work zone, could get within the minimum approach distance of an overhead power line.
 - The equipment is used to hoist personnel.
 - The equipment is used over a shaft, cofferdam, or in a tank farm.
 - For multiple-lift rigging, except where the authorized worker performing direct supervision determines that the trainee's/apprentice's skills are sufficient for this high-skill work
 - All training of all apprentices or other uncertified operators shall be approved by the program or manager
- 4.10.5 For critical lifts, only crane operators certified to the appropriate jurisdictional standards and proven competent in the operation of the specific crane used in the lift may operate the crane.
- 4.10.6 WARNING: No apprentice operator/operator in training shall be permitted to operate any crane involved in a lift without sufficient prior training and direct, competent supervision appropriate to the equipment operated UNLESS jurisdictional standards permit otherwise.

- 4.10.7 The crane operator shall be qualified to use and be familiar with the hoisting equipment to be operated; otherwise sufficient time and instruction to adequately inspect and test the equipment shall be given.
- 4.10.8 The operator shall be able to perform and document, in a crane logbook, daily pre-operational maintenance checks to confirm the equipment can safely handle all loads. Crane operators shall have a general working knowledge of relevant safety codes and standards applicable to the operation of the given crane.
- 4.11 Signal Person Qualification
- 4.11.1 The manager (or his/her designee) of the signal person shall confirm that each signal person meets the qualification requirements prior to giving any signals. This requirement will be met by using either of the following options:
- Option 1 – Third-party-qualified evaluator: The signal person has documentation from a third-party qualified evaluator showing that the signal person meets the Qualification Requirements.
 - Option 2 – Manager's (or his/her designee's) qualified evaluator: The manager (or his/her designee) has his/her qualified evaluator assess the individual and determine that the individual meets the Qualification Requirements and provides documentation of that determination. An assessment by a manager's (or his/her designee's) qualified evaluator under this option is not portable – other managers (or their designees) are not permitted to use it to meet the requirements of this section.
 - The documentation for whichever option is used will be available while the signal person is employed by the manager (or his/her designee).
- 4.11.2 If subsequent actions by the signal person indicate that the individual may not meet the Qualification Requirements, the manager (or his/her designee) shall not allow the individual to continue working as a signal person until retraining is provided and a reassessment is conducted, which confirms that the individual meets the Qualification Requirements.
- 4.11.3 Qualification Requirements. Each signal person shall:
- Know and understand the type of signals used. If hand signals are used, the signal person shall know and understand the Standard Method for hand signals. Refer to *S3AM-310-ATT2 Standard Hand Signals*.
 - Be competent in the application of the type of signals used.
 - Have a basic understanding of equipment operation and limitations, including the crane dynamics involved in swinging and stopping loads, and boom deflection from hoisting loads.
 - Know and understand the relevant requirements of this procedure.
 - Demonstrate that he/she meets the requirements of this section through a verbal or written test and through a practical test.
 - Be familiar with working around Heavy equipment as outlined in *S3AM-309-PR1 Heavy Equipment*.
- 4.12 Rigger Qualification
- 4.12.1 Personnel shall be trained in the selection of rigging, inspection, cautions to personnel, effects of the environment, and rigging practices.
- Refer to *S3AM-310-ATT3 Rigging*.
- 4.13 Maintenance and Repair Workers' Qualifications

Maintenance, inspection, and repair personnel are permitted to operate the equipment only if the following requirements are met:

- 4.13.1 The operation is limited to those functions necessary to perform maintenance, and to inspect or verify the performance of the equipment.
- 4.13.2 The personnel either:
 - Operate the equipment under the direct supervision of an operator who meets the requirements of Section 4.10 Crane Operator Qualifications of this procedure; or
 - Are familiar with the operation, safe limitations, characteristics, and hazards associated with the type of equipment.
- 4.13.3 Maintenance and repair personnel shall meet the definition of a qualified person with respect to the equipment and maintenance/repair tasks performed.
- 4.14 Overhead Power Line Safety
 - 4.14.1 Before assembling or disassembling of a crane or operation of a crane, the manager (or his/her designee) shall determine if any part of the assembly / disassembly equipment, crane, load line, or load (including rigging and lifting accessories) could get closer than 50 feet (15.25 meters) to an power line during the assembly/disassembly process or during crane operation.
 - 4.14.2 The manager (or his/her designee) shall assume that all power lines are energized unless the utility owner/operator confirms that the power line has been and continues to be de-energized and visibly grounded at the worksite.
 - The overhead power line owner/operator (e.g. local utility company) shall be contacted to determine the voltage of the overhead line and establish the appropriate minimum approach distance (MAD). Assembly/disassembly and crane operation inside the MAD is prohibited. Work or equipment operation closer than the MAD specified by regulation is only permitted when the following requirements are met:
 - The manager (or his/her designee) determines that it is infeasible to do the work without breaching the minimum approach distance as specified by regulatory requirements.
 - The manager (or his/her designee) determines that, after consultation with the utility owner/operator, it is infeasible to de-energize and ground the power line or relocate the power line.
 - The power line owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution determines the specific MAD that shall be maintained to prevent electrical contact in light of the on-site conditions. The factors that shall be considered in making this determination include, but are not limited to:
 - Conditions affecting atmospheric conductivity;
 - Time necessary to bring the equipment, load line, and load (including rigging and lifting accessories) to a complete stop;
 - Wind conditions;
 - Degree of sway in the power line;
 - Lighting conditions; and
 - Conditions affecting the ability to prevent electrical contact.
 - A planning meeting with the manager (or his/her designee) and utility owner/operator (or a qualified person with respect to electrical power transmission and distribution) is held to determine the procedures that will be followed to prevent electrical contact and electrocution.
 - Procedures shall be documented, reviewed with affected personnel and be immediately

available on-site.

- No part of a crane/derrick, load line, or load (including rigging and lifting accessories), whether partially or fully assembled, is allowed within the MAD unless the manager (or his/her designee) has confirmed that the utility owner/operator has de-energized and visibly grounded the power line (at the worksite).
- Work below an energized power line is permitted only if the manager confirms the uppermost part of the equipment (including those equipped with an extensible boom in the fully extended position at true vertical) could not encroach on the MAD.

4.14.3 Refer to *S3AM-322-PR1 Overhead Lines* for additional requirements.

4.14.4 The location of the power line(s), and the steps that will be implemented to prevent encroachment/electrocution (e.g. barricades, insulators, signal person, proximity alarms, warning lines, etc.) shall be included in the SH&E Plan and THA. This information shall be reviewed and communicated to affected personnel in the tailgate or specific pre-lift meeting.

4.14.5 There shall be at least one electrocution hazard warning conspicuously posted in the crane cab so that it is in view of the operator and tower(except for overhead gantry).

4.14.6 Use only non-conductive tag lines.

4.14.7 When working near transmitter/communication towers where the equipment is close enough for an electrical charge to be induced in the equipment or materials being handled, the transmitter will be de-energized, or the following precautions will be taken when necessary to dissipate induced voltages:

- Provide the equipment with an electrical ground.
- Use non-conductive rigging or an insulating link/device.

4.14.8 Overhead Power Line Safety Training

- Train operators and crew assigned to work with the equipment on the following:
 - The procedures to be followed in the event of electrical contact with a power line, including:
 - Information regarding the danger of electrocution from the operator simultaneously touching the equipment and the ground.
 - The importance to the operator's safety of remaining inside the cab, except where there is an imminent danger of fire, explosion, or other emergency that necessitates leaving the cab.
 - The safest means of evacuating from equipment that may be energized.
 - The danger for the potentially energized zone around the equipment.
 - The need for crew in the area to avoid approaching or touching the equipment.
 - Safe clearance distance from power lines.
 - Power lines are presumed to be energized unless the utility owner/operator confirms that the power line has been and continues to be de-energized and visibly grounded at the worksite.
 - Power lines are presumed to be un-insulated unless the utility owner/operator or a registered engineer who is a qualified person with respect to electrical power transmission and distribution confirms that a line is insulated.
 - The limitations of an insulating link/device, proximity alarm, and range control (and similar) device, if used.

- Train persons working as dedicated spotters to enable them to effectively perform their task, including training on the applicable requirements of this section.
- 4.14.9 Devices originally designed by the manufacturer for use as:
- A safety device, operational aid, or a means to prevent power line contact or electrocution, when used to comply with this section, shall meet the manufacturer's procedures for use and conditions of use.
- 4.15 Equipment Modifications
- 4.15.1 Modifications or additions that affect the capacity or safe operation of the equipment are prohibited except where the requirements listed below apply.
- 4.15.2 Manufacturer's review and approval
- The manufacturer approves the modifications/additions in writing.
 - The load charts, procedures, instruction manuals, and instruction plates/tags/decals are modified as necessary to accord with the modification/addition.
 - The original safety factor of the equipment is not reduced.
- 4.15.3 Unavailable manufacturer.
- If the manufacturer is unavailable, modifications or additions shall only be c the direction of a qualified person (e.g. professional engineer).
 - The load charts, procedures, instruction manuals, and instruction plates/tags/decals are modified at the direction of the qualified person and as necessary to accord with the modification/addition.
- 4.16 Assembly/Disassembly of Cranes
- 4.16.1 Supervision
- Assembly/disassembly shall be supervised by a person who meets the criteria for both a competent person and a qualified person, or by a competent person who is assisted by one or more qualified persons (assembly / disassembly [A/D] supervisor). The A/D supervisor shall be experienced in working with the make and model of equipment being assembled or disassembled.
 - Where the assembly/disassembly is being performed by only one person, that person shall meet the criteria for both a competent person and a qualified person; an A / D supervisor.
- 4.16.2 Knowledge of procedures
- The A/D supervisor shall understand the applicable assembly/disassembly procedures.
- 4.16.3 Review of procedures
- The A/D supervisor shall review the applicable assembly/disassembly procedures, Pre-Job Hazard Assessment, Task Hazard Assessment (THA) for each task, or a written Assembly/Disassembly Procedure (Refer to *S3AM-310-FM12 Assembly - Disassembly Procedure*).
 - This review will be completed immediately prior to the commencement of assembly/disassembly, unless the A/D supervisor has applied them to the same type and configuration of equipment (including accessories, if any) so that they are already known and understood.
- 4.16.4 Develop crew instructions for assembly/disassembly operation by using the minimum of a JSA for each task to be performed.

- Before commencing assembly/disassembly operations, during assembly/disassembly operations, before a crew member takes on a different task, or when adding new personnel during the operations the A/D supervisor shall determine that the crew members understand the following:
 - Their tasks;
 - The hazards associated with their tasks; and
 - The hazardous position/locations that they need to avoid.

4.16.5 Protecting assembly/disassembly crew members out of operator view

- Before a crew member goes to a location that is out of view of the operator and is either in, on, under, or near the equipment (or load) where the crew member could be injured by movement of the equipment (or load), the crew member shall inform the operator that he/she is going to that location.
 - Where the crane operator knows that a crew member went to one of the above mentioned locations, the operator will not move any part of the equipment (or load) until the operator is informed in accordance with a pre-arranged system of communication that the crew member is in a safe position.

4.16.6 Working under the boom, jib, or other components

- When pins (or similar devices) are being removed, workers shall not be under the boom, jib, or other components, except where:
 - The manager (or his/her designee) demonstrates that site constraints require one or more workers to be under the boom, jib, or other components when pins (or similar devices) are being removed, the A/D supervisor shall implement procedures that minimize the risk of unintended dangerous movement, and minimize the duration and extent of exposure under the boom.

4.16.7 Capacity limits. During all phases of assembly/disassembly, rated capacity limits for loads imposed on the equipment, equipment components (including rigging), lifting lugs, and equipment accessories shall not be exceeded for the equipment being assembled/disassembled.

4.16.8 Addressing specific hazards. The A/D supervisor shall address the hazards associated with the operation with methods to protect the workers from them, as follows:

- Site and ground-bearing conditions. Site and ground conditions shall be adequate for safe assembly/disassembly operations and to support the equipment during assembly/disassembly.
- Blocking material. The size, amount, condition, and method of stacking blocking shall be sufficient to sustain the loads and maintain stability.
- Proper location of blocking. When used to support lattice booms or components, blocking shall be appropriately placed to:
 - Protect the structural integrity of the equipment; and
 - Prevent dangerous movement and collapse.
- Verifying assist crane loads. When using an assist crane, the loads that will be imposed on the assist crane at each phase of assembly/disassembly shall be verified before assembly/disassembly begins, in order to prevent exceeding rated capacity limits for the assist crane.
- Boom and jib pick points. The point(s) of attachment of rigging to a boom (or boom sections, or jib or jib sections) shall be suitable for preventing structural damage and facilitating safe handling of these components.

- Center of gravity
 - Identify the center of gravity of the load if necessary for the method used for maintaining stability.
 - Where there is insufficient information to accurately identify the center of gravity, use measures designed to prevent unintended dangerous movement resulting from an inaccurate identification of the center of gravity.
 - Stability upon pin removal. Rig or support the boom sections, boom suspension systems (such as gantry A-frames and jib struts), or components to maintain stability upon the removal of the pins.
 - Snagging. Do not allow suspension ropes and pendants to catch on the boom or jib connection pins or cotter pins (including keepers and locking pins).
 - Struck by counterweights. Prevent the potential for unexpected movement from inadequately supported counterweights and from hoisting counterweights.
 - Boom-hoist brake failure. Where reliance is placed on the boom-hoist brake to prevent boom movement during assembly/disassembly, the brake will be tested to determine if it is sufficient to prevent boom movement. If it is not sufficient, a boom hoist pawl, other locking device/back-up braking device, or another method of preventing dangerous movement of the boom (such as blocking or using an assist crane) from a boom-hoist brake failure will be used.
 - Loss of backward stability. Consider backward stability before swinging the upper works, travel, and the attaching or removing equipment components.
 - Wind speed and weather. Consider wind speed and weather so that the safe assembly/disassembly of the equipment is not compromised.
- 4.16.9 Cantilevered boom sections. Do not exceed manufacturer's limitations on the maximum amount of boom supported only by cantilevering. When such limitations are not available, a registered professional engineer familiar with the type of equipment involved will determine this limitation in writing: this limit shall not be exceeded.
- 4.16.10 Weight of components. The weight of the components shall be readily available.
- 4.16.11 Components and configuration
- The selection of components and configuration of the equipment that affects the capacity or safe operation of the equipment shall be in accordance with:
 - Manufacturer's instructions, limitations, and specifications. Where these are unavailable, a registered professional engineer familiar with the type of equipment involved shall approve, in writing, the selection and configuration of components; or
 - Approved modifications that meet the equipment requirements.
 - Post-assembly inspection. Upon completion of assembly, inspect the equipment to confirm compliance with the AECOM initial and annual crane inspection and load testing.
- 4.16.12 Manufacturer's prohibitions. The manager (or his/her designee) shall comply with applicable manufacturer's prohibitions.
- 4.16.13 Shipping pins. Remove reusable shipping pins, straps, links, and similar equipment, and store so that they do not present a falling-object hazard.
- 4.16.14 Pile driving. Equipment used for pile driving shall not have a jib attached during pile-driving operations.
- 4.16.15 Outriggers. When the load to be handled and the operating radius require the use of outriggers, or at any time when outriggers are used, the following requirements shall be met:

- The outriggers shall be either fully extended; or, if the manufacturer's procedures permit, deployed as specified in the load chart.
- The outrigger shall be set with the machine-supported level, on fully extended outriggers with all tires free of the supporting surface (clear of the surface), except for locomotive cranes (see paragraph 15.f of this section for use of outriggers on locomotive cranes).
- When outrigger floats are used, they shall be attached to the outriggers.
- Each outrigger shall be visible to the operator or to a signal person during extension and setting.
- Outrigger blocking shall:
 - Meet the requirements in paragraphs 8.b and 8.c of this section.
 - Be placed only under the outrigger float, and/or the outrigger jack. Where the outrigger is designed without a jack, the blocking shall be placed under the outer bearing surface of the extended outrigger beam.
- For locomotive cranes, when using outriggers to handle loads, the manufacturer's procedures shall be followed. When lifting loads without using outriggers, the manufacturer's procedures will be met regarding truck wedges or screws.

4.16.16 Assembly/Disassembly – Additional Requirements for Booms and Jibs

- Do not remove any of the pins in the pendants (partly or completely) when the pendants are in tension.
- Do not remove any of the pins (top and bottom) on boom sections located between the uppermost boom section and the crane/derrick body (partly or completely) when the boom is being supported by the uppermost boom section resting on the ground (or other support).
- Do not remove any of the top pins on boom sections located on the cantilevered portion of the boom being removed (the portion being removed ahead of the pendant attachment points) (partly or completely) until the cantilevered section to be removed is fully supported.

4.16.17 Assembly/Disassembly – Manager Procedures

- When using the manager's (or his/her designee's) procedures instead of the manufacturer's procedures for assembling or disassembling, the manager (or his/her designee) shall confirm that the procedures are designed to:
 - Prevent unintended dangerous movement, and prevent collapse of all parts of the equipment.
 - Provide adequate support and stability of all parts of the equipment during the assembly/disassembly process.
 - Position workers involved in the assembly/disassembly operation so that their exposure to unintended movement or collapse of part or all of the equipment is minimized.
- Manager's procedures shall be developed by a qualified person.

4.17 Operation

- #### 4.17.1
- The manager (or his/her designee) will comply with all the manufacturer's procedures applicable to the operational functions of equipment, including its use with attachments. The manager (or his/her designee) should consider the use of equipment that has all the manufacturer's procedures and information available during the planning stages of the project.

4.17.2 Unavailable Operation Procedures

- Where the manufacturer's procedures are unavailable, the manager (or his/her designee) will develop and confirm compliance with all procedures necessary for the safe operation of the equipment and attachments.
- Procedures for the operational controls shall be developed by a qualified person.
- Procedures related to the capacity of the equipment shall be developed and signed by a registered professional engineer familiar with the equipment.

4.17.3 Operational procedures

- All cranes arriving on site require pre-inspection, initial and annual inspections, load test, and verification of operator qualifications.
- Prior to operation of crane on site, conduct pre-lift planning in accordance with *S3AM-310-FM2 Lift Classification* or assembly/disassembly procedures. Refer to *S3AM-310-FM12 Assembly – Disassembly Procedure*.
- Equipment set-up.
 - Confirm the equipment will be uniformly level, within 1 percent of level grade, and located on footing that a qualified person has determined to be sufficiently firm and stable.
 - Equipment with outriggers shall have all outriggers extended and locked. The amount of extension shall be the same for all outriggers, and in accordance with the manufacturer's procedures and load charts.
- Procedures related to the capacity of the equipment shall be developed and signed by a registered professional engineer familiar with the equipment.

4.17.4 Accessibility of procedures

- The procedures applicable to the operation of the equipment, including rated capacities (load charts), recommended operating speeds, special hazard warnings, instructions, and operator's manual, shall be readily available in the cab at all times for use by the operator.
- Where rated capacities are available in the cab only in electronic form: in the event of a failure that makes the rated capacities inaccessible, the operator shall immediately cease operations or follow safe shut-down procedures until the rated capacities are available.

4.17.5 The operator shall not engage in any practice that diverts his/her attention while actually engaged in operating the crane, such as the use of cell phones (other than when used for signal communications) or other attention-diverting activities.

4.17.6 Leaving the equipment unattended

- The operator shall not leave the controls while the load is suspended, except where permitted by the applicable jurisdiction and the following are met:
 - The operator remains adjacent to the equipment and is not engaged in any other duties.
 - The load is to be held suspended for a period of time exceeding normal lifting operations.
 - The competent person determines that it is safe to do so, and implements measures necessary to restrain the boom hoist and telescoping, load, swing, and outrigger functions.
 - Barricades or caution lines (and notices) are erected to prevent all workers from entering the fall zone. Do not permit workers in the fall zone.
- The provisions of this section do not apply to working gear (such as slings, spreader bars, ladders, and welding machines) where the load is not suspended over an entrance or exit.

4.17.7 Tag-Out

- Where the manager (or his/her designee) has taken the equipment out of service, a tag shall be placed in the cab stating that the equipment is out of service and is not to be used. Where the manager (or his/her designee) has taken a function(s) out of service, a tag shall be placed in a conspicuous position stating that the function is out of service and is not to be used.
 - Response to “Do Not Operate” tag-out signs
 - If there is a warning (tag-out or maintenance/do not operate) sign on the equipment or starting control, the operator shall not activate the switch or start the equipment until the sign has been removed by a management person authorized to remove it.
 - An inspection of the entire area shall be completed, and all attempts shall be made to locate the person who applied the tag or lock prior to any actions. If the person who applied the tag or lock cannot be located, the following steps shall be adhered to. Management shall determine that:
 - No one is servicing, working on, or otherwise in a dangerous position on the machine.
 - The equipment has been repaired and is working properly.
- 4.17.8 Before starting the engine, the operator shall verify that all controls are in the proper starting position and that all personnel are in the clear.
- 4.17.9 When a local storm warning has been issued, the competent person will determine whether it is necessary to implement manufacturer’s recommendations for securing the equipment.
- 4.17.10 The operator shall be familiar with the equipment and its proper operation. If adjustments or repairs are necessary, the operator shall promptly inform the person designated by the manager to receive such information; and, where there are successive shifts, inform the next operator.
- 4.17.11 In all cases verified weights, measured radii, and manufacturer’s loads and capacity chart/capacities and instructions will take precedence over operational aids when handling a load.
- 4.17.12 If the competent person determines that there is a slack rope condition requiring re-spooling of the rope, it will be verified (before starting to lift) that the rope is seated on the drum and in the sheaves as the slack is removed.
- 4.17.13 The competent person will consider the effect of wind, ice, and snow on equipment stability and rated capacity. Crane Manufacturers Operators Manual should be referenced to determine the wind speed and temperature restrictions that apply to each specific crane.
- 4.17.14 Compliance with rated capacity
- Do not operate the equipment in excess of its rated capacity.
 - The operator will verify that the load is within the rated capacity of the equipment by at least one of the following methods:
 - The weight of the load will be determined from a reliable source (such as the load’s manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per-foot weight), or by other equally reliable means. In addition, when requested by the operator, this information will be provided to the operator prior to the lift; or
 - The operator will begin hoisting the load to determine—using a load-weighing device—load-moment indicator, rated-capacity indicator, or rated-capacity limiter, if it exceeds 75 percent of the maximum rated capacity at the longest radius that will be used during the lift operation. If it does, the operator will not proceed with the lift until management verifies the weight of the load.
- 4.17.15 The boom or other parts of the equipment shall not contact any obstruction.
- 4.17.16 Do not use the equipment to drag or pull loads sideways.

- 4.17.17 On wheel-mounted equipment, do not lift loads over the front area, except as permitted by the manufacturer.
- 4.17.18 The operator will test the brakes each time a load that is 90 percent or more of the maximum line pull is handled by lifting the load a few inches and applying the brakes. In duty cycle and repetitive lifts where each lift is 90 percent or more of the maximum line pull, this requirement applies to the first lift, but not to successive lifts.
- 4.17.19 Do not lower the load or the boom below the point where less than two full wraps of rope remain on their respective drums.
- 4.17.20 Traveling with a load.
 - Traveling with a load is prohibited if the practice is prohibited by the manufacturer.
 - Where traveling with a load, the manager (or his/her designee) will confirm that:
 - A competent person supervises the operation, determines if it is necessary to reduce rated capacity, and makes determinations regarding load position, boom location, ground support, travel route, overhead obstructions, and speed of movement necessary to confirm safety.
 - The determinations of the competent person are implemented.
 - For equipment with tires, maintain tire pressure specified by the manufacturer.
- 4.17.21 Rotational speed of the equipment shall be such that the load does not swing out beyond the radius at which it can be controlled.
- 4.17.22 A tag or restraint line shall be used if necessary to prevent rotation of the load that would be hazardous.
- 4.17.23 Adjust the brakes in accordance with the manufacturer's procedures to prevent unintended movement.
- 4.17.24 The operator shall obey a stop (or emergency stop) signal, irrespective of who gives it.
- 4.17.25 A locomotive crane shall not be swung into a position where it is reasonably foreseeable that railway cars on an adjacent track could strike it, until it is determined that cars are not being moved on the adjacent track, and that proper flag protection has been established.
- 4.17.26 Counterweight/Ballast
 - The following applies to equipment other than tower cranes:
 - Do not operate equipment without the counterweight or ballast in place, as specified by the manufacturer.
 - Do not exceed the maximum counterweight or ballast specified by the manufacturer for the equipment.
- 4.17.27 Authority to Stop Operation
 - Whenever there is a safety concern, the operator or any other workers associated with the operation have the authority to stop, and refuse to handle loads until a qualified person has determined that safety has been assured. Refer to *S3AM-002-PR1 Stop Work Authority*.
- 4.18 Swing Radius Hazards
 - 4.18.1 The requirements in paragraph 2 of this section apply where there are accessible areas in which the equipment's rotating superstructure (whether permanently or temporarily mounted) poses a reasonably foreseeable risk of:
 - Striking and injuring a worker; or

- Pinching/crushing a worker against another part of the equipment or another object.

4.18.2 To prevent workers from entering these hazard areas, the manager (or his/her designee) shall:

- Instruct workers assigned to work on or near the equipment (authorized personnel) in how to recognize struck-by and pinch/crush hazards areas posed by the rotating superstructure.
- Erect and maintain control lines, warning lines, railings, or similar barriers to mark the boundaries of the hazard areas. Exception: where it is neither feasible to erect such barriers on the ground nor on the equipment, the hazards areas shall be clearly marked by a combination of warning signs and high-visibility markings on the equipment that identify the hazard areas. In addition, the manager (or his/her designee) shall train the workers to understand what these markings signify.

4.18.3 Protecting Workers in the Hazard Area

- Before a worker goes to a location in the hazard area out of view of the operator, the worker (or someone instructed by the worker) shall confirm the operator is informed of the area out of the view where the worker will be present.
- Where the operator knows that a worker went to a location out of his/her view, the operator will not rotate the superstructure until the operator:
 - Is informed in accordance with a pre-arranged system of communication that the worker is in a safe position.

4.18.4 Multiple Equipment Coordination. Where any part of a crane/derrick is within the working radius of another crane/derrick, the controlling entity shall institute a system to coordinate operations. If there is no controlling entity, the manager (or his/her designee) shall institute such a system.

4.18.5 Keeping Clear of the Load

- Where available, hoisting routes that minimize the exposure of workers to hoisted loads will be used, to the extent consistent with public safety.
- Although the operator is not moving a suspended load, no worker will be within the fall zone, except for workers:
 - Engaged in hooking, unhooking, or guiding a load;
 - Engaged in the initial attachment of the load to a component or structure; or
 - Operating a concrete hopper or concrete bucket.

4.18.6 When workers are engaged in hooking, unhooking, or guiding the load, or in the initial connection of a load to a component or structure and are within the fall zone, the following criteria shall be met:

- Rig the materials being hoisted to prevent unintentional displacement.
- Use hooks with self-closing latches or their equivalent. Exception: "J" hooks are permitted to be used for setting wooden trusses.
- Confirm the materials are rigged by a qualified rigger. Refer to *S3AM-310-ATT3 Rigging*.

4.18.7 Receiving a load. Only workers needed to receive a load will be permitted to be within the fall zone when a load is being landed.

4.18.8 During a tilt-up or tilt-down operation:

- No worker will be directly under the load.
- Only workers essential to the operation will be in the fall zone (but not directly under the load).
Note: Boom free-fall is prohibited when a worker is in the fall zone of the boom or load.

4.19 Free-fall and Controlled-Load Lowering

4.19.1 This section does not apply to side-boom cranes in which the boom is designed to free-fall (live boom) that are manufactured prior to January 2009.

4.19.2 Boom and load free-fall prohibitions

- The use of equipment in which the boom is designed to free-fall (live boom) is prohibited in each of the following circumstances:
 - A worker is in the fall zone of the boom or load.
 - A worker is being hoisted.
 - The load or boom is directly over a power line, or over any part of the MAD to each side of the power line.
 - The load is over a shaft.
 - The load is over a cofferdam, except where there are no workers in the fall zone.
 - Lifting operations are taking place in a refinery or tank farm.
- The use of equipment in which the boom is designed to free-fall (live boom) is permitted only where none of the circumstances listed above are present and:
 - The equipment was manufactured prior to October 31, 1984; or
 - The equipment is a floating crane/derrick or a land crane/derrick on a vessel/flotation device.

4.19.3 Preventing boom free-fall. Where the use of equipment with a boom that is designed to free-fall (live boom) is prohibited, the boom hoist shall have a secondary mechanism or device designed to prevent the boom from falling in the event the primary system used to hold or regulate the boom hoist fails, as follows:

- Friction drums; these shall have:
 - A friction clutch and a braking device to allow for controlled boom lowering.
 - A secondary braking or locking device, which is manually or automatically engaged, to back up the primary brake while the boom is held (such as a secondary friction brake or a ratchet and pawl device).
- Hydraulic drums shall have an integrally mounted holding device or internal static brake to prevent boom hoist movement in the event of hydraulic failure.
- Neither clutches nor hydraulic motors will be considered brake or locking devices for purposes of this subpart.
- Hydraulic boom cylinders shall have an integrally mounted holding device.

4.19.4 Preventing uncontrolled retraction. Hydraulic telescoping booms shall have an integrally mounted holding device to prevent the boom from retracting in the event of hydraulic failure.

4.20 Signals – General Requirements

4.20.1 A signal person shall be provided in each of the following situations:

- The point of operation, meaning the load travel or the area near or at load placement, is not in full view of the operator.
- When the equipment is traveling, the view in the direction of travel is obstructed.
- Due to site-specific safety concerns, either the operator or the person handling the load determines that it is necessary.

4.20.2 Types of signals. Signals to operators shall be by hand, voice or audible.

- Signals other than hand, voice, or audible signals may be used where the manager (or his/her designee) demonstrates that:
 - The new signals provide communication at least equally effective as voice, audible, or standard method hand signals; or
 - There is a national consensus standard for the new signals.
- The signals used (hand, voice, audible, or new), and means of transmitting the signals to the operator (such as direct line of sight, video, radio, etc.), shall be appropriate for the site conditions.
- During operations requiring signals, the ability to transmit signals between the operator and signal person shall be maintained. If that ability is interrupted at any time, the operator will safely stop operations requiring signals until it is reestablished, and a proper signal is given and understood.
- If the operator becomes aware of a safety problem and needs to communicate with the signal person, the operator shall safely stop operations. Operations may not resume until the operator and signal person agree that the problem has been resolved.
- Only one person gives signals to a crane/derrick at a time, however anyone who becomes aware of a safety problem shall alert the operator or signal person by giving the stop or emergency stop signal. Note that this procedure requires the operator to obey any stop or emergency stop signal.
- All directions given to the operator by the signal person shall be given from the operator's direction perspective.
- Communication with multiple cranes/derricks. Where a signal person(s) is in communication with more than one crane/derrick, a system for identifying which crane/derrick each signal is for shall be used, as follows:
 - For each signal, prior to giving the function/direction, the signal person will identify the crane/derrick the signal is for; or
 - An equally effective method of identifying which crane/derrick the signal is for shall be used.
- Signals – Radio, Telephone, or other Electronic Transmission
 - Test the device(s) used to transmit signals on site before beginning operations to confirm that the signal transmission is clear and reliable.
 - Signal transmission shall be through a dedicated channel. Exception: Multiple cranes/derricks and one or more signal persons may share a dedicated channel for the purpose of coordinating operations.
 - The operator's reception of signals shall be by a hands-free system.
- Signals – Voice
 - Prior to beginning operations, the operator, signal person, and lift supervisor (if there is one), will contact each other and agree on the voice signals that will be used. Once the voice signals are agreed upon, these workers need not meet again to discuss voice signals unless another worker is substituted; there is confusion about the voice signals; or a voice signal is to be changed.
 - Each voice signal shall contain the following three elements, given in the following order: function (such as hoist, boom, etc.), direction (distance and/or speed); and the 'stop' command.
 - The operator, signal person, and lift supervisor (if there is one), shall be able to effectively

communicate in the language used.

- Signals – Hand Signal Chart
 - Hand signal charts shall either be posted on the equipment or readily available at the site. Refer to *S3AM-310-ATT2 Standard Hand Signals*.
 - Both the operator and the signaler shall be conversant in the standard hand signals.
 - Operators shall only take slow, smooth and decisive signals from a qualified, designated and identifiable signaler.
 - The operator shall obey an emergency stop signal given by any personnel.

4.21 Training

The manager (or his/her designee) shall provide training in accordance with regulatory requirements, certification / licensing requirements and *S3AM-003-PR1 SH&E Training*. As applicable, training may include, but is not limited to:

4.21.1 Overhead power lines.

4.21.2 Signal persons.

4.21.3 Equipment operation.

- Train operators who are not qualified or certified under the conditions within this standard in those areas addressed in this standard. Provide retraining if necessary for re-qualification or re-certification or if the operator does not pass a qualification or certification test.
- Train operators in the following practices:
 - On friction equipment, whenever moving a boom off a support, first raise the boom a short distance (sufficient to take the load off the boom) to determine if the boom hoist brake needs to be adjusted. On other types of equipment, the same practice is applicable, except that typically there is no means of adjusting the brake; if the brake does not hold, a repair is necessary.
 - Where available, the manufacturer's emergency procedures for halting unintended equipment movement.

4.21.4 Competent persons and qualified persons. Train competent persons and qualified persons regarding the requirements of standards and regulations applicable to their respective roles. Refer to *S3AM-202-PR1 Competent Person Designation*.

4.21.5 Crush/pinch points. Instruct workers who work with the equipment to keep clear of holes, and crush/pinch points and the hazards addressed in this procedure (work area control).

4.21.6 Fall Protection

4.21.7 Lock-out /Tag-out. Train operators and other workers authorized to start/energize equipment or operate equipment controls (such as maintenance and repair workers) in the tag-out measures in this procedure.

4.21.8 Training administration

- The manager (or his/her designee) shall confirm that workers required to be trained under this procedure are evaluated to confirm that they understand the information provided in the training.
- Provide refresher training in relevant topics when, based on the conduct of the worker or an evaluation of the worker's knowledge, there is an indication that retraining is necessary

4.22 Critical Lifts

- 4.22.1 Critical lift identifies loads classified as requiring a formal, written plan.
- 4.22.2 A critical lift plan shall be developed by an appropriately competent and qualified person or persons and requires review and approval by the involved individuals (e.g. rigging supervisor, crane operator, AECOM manager, etc.).
- 4.22.3 Critical Lift Plan Requirements
 - A Critical Lift Plan consists of as many drawings, specifications, and procedures as necessary to accurately assess all important load factors and site factors relating to a Critical Lift. These items are included as a guide, but should not be interpreted as being all-inclusive in the analysis and preparation of a Critical or Pre-Engineered Lift. Sound engineering and planning is still the responsibility of the engineer and/or project supervisor associated with the lift. Supplemental Information D (Checklist for Lift Planning) summarizes those factors. Most lifts do not involve all of the factors listed there.
 - The following is the minimum level of information required for completing an adequate critical lift plan:
 - Elevation View Drawing of the crane, load, and any nearby structures that could cause interference. This drawing shall be made to scale and should note:
 - Crane manufacturer(s), model(s), and counterweight(s), if variable.
 - Boom length(s) and lifting radius.
 - Maximum load elevation during lifting procedure.
 - Any jibs or special lifting devices required.
 - Minimum number of parts of crane hoist line required for lifting the load.
 - All required slings, shackles, and other rigging components identified by capacity, size, length, and location.
 - Calculated center of gravity of load.
 - Plan View Drawing of the crane, load, and nearby structures that could cause interference. This drawing shall be made to scale and should note:
 - Route that transport will take to position the load for lifting.
 - Initial lifting position of the load, including radius. Lifting radius shall be accurately determined.
 - Final placement position of the load, including radius. Lifting radius shall be accurately determined.
 - Location of the crane(s), including tail swing limits.
 - Route that crane(s) will take if walking with the load, as well as associated matting requirements.
 - Any utilities located within the work zone. Underground facilities—piping, ducts, etc.—shall be accurately located.
 - Space may be needed to assemble crane.
 - Planning shall include load transportation considerations, such as how to get the load close enough to the crane. This may be a function of the type of crane being used, because some cranes perform better in certain sectors (quadrants) of operation than others.
 - Lift Analysis, including:

- Tabulation of the gross load weight, including the weight of all blocks and rigging tackle.
- Rigging attachment points and special rigging requirements.
- Gross rated capacity of the crane in the configuration specified.
- Calculation of the percentage of the crane's rated capacity at which the lift will be made.
- Crane-imposed soil loads shall be determined. Soil analysis may be needed to verify crane-imposed loads can be safely supported.
- Allowable weather conditions for the lift, and the effect of wind loading.
- Sequence of work, including lift-off, steady-state conditions, and set-down of load (including positions where there is a shift in the location of the center of gravity, for the pick points).
- Copy of the completed *S3AM-310-FM3 Critical Lift Plan*.
- Copy of crane range diagram.
- Copy of crane load chart.
- Rigging diagram indicating minimum size of slings and shackles.
- Calculation indicating adequacy of rigging.
- Copy of crane outline dimensions.
- All potential complicating issues for any lift shall be addressed in the lift plan; however, for a relatively simple operation, the above items can provide sufficient information, and may even be organized onto one drawing.

4.23 Personnel Hoisting

- 4.23.1 Hoisting personnel is considered to be a Critical Lift. The requirements of this section are supplemental to the other requirements in this procedure, and apply when one or more workers are hoisted.
- 4.23.2 All of the following criteria shall be observed and in place prior to any personnel hoisting. Complete *S3AM-310-FM11 Personnel Platform Lifting* along with applicable signatures prior to lifting, as well as any criteria required in the Critical Lifts section of this standard.
- 4.23.3 Hoisting of personnel shall only be permitted when AECOM can show that the erection, use, and dismantling of conventional means of reaching the worksite, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold, would be more hazardous, or is not possible because of the project's structural design or worksite conditions.
- 4.23.4 Hoisting of personnel is always prohibited (even if hoisting personnel is otherwise permitted), when:
- Any part of the equipment would encroach on the MAD of a power line.
 - Equipment is traveling unless the equipment travels on fixed rails or the employer can demonstrate that there is no less hazardous way to perform the work. However, when the equipment is a derrick, it may not be used to hoist personnel while traveling under any circumstances.
 - The equipment has a rated hoisting/lifting capacity of 2,000 pounds (907 kilograms) or less.
- 4.23.5 Exceptions: If the use of a personnel platform is not feasible:
- When transferring a worker into and out of drill shafts that are up to and including 8 feet (2.4 meters) in diameter, the worker may be hoisted in a boatswain's chair.

- In pile driving operations, the worker may be hoisted in a boatswain's chair.
- In storage tank (steel or concrete), shaft, and chimney operations, the worker may be hoisted in a boatswain's chair.
- Solely for transfer to or from a marine worksite, the worker may be transported in a marine hoisted-personnel transfer device.
- In addition to the same crane setup and operational requirements for personnel platforms, the following apply to hoisting workers using a boatswain's chair:
 - The boatswain's chair itself (excluding the personal fall arrest system anchorages), shall be capable of supporting, without failure, its own weight and at least five times the maximum intended load.
 - No more than one person will be hoisted at a time.
 - For lattice-boom cranes, the cable shall be clearly marked, so that it can easily be seen by the operator, at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, and use a spotter. If using a boatswain's chair:
 - Worker shall be hoisted in a slow, controlled descent and ascent.
 - The worker shall use personal fall protection equipment, including a full body harness, independently attached to the lower load block or overhaul ball. Refer to *S3AM-304-PR1 Fall Protection*.
 - Station a signal person at shaft openings.
- In addition to the same crane setup and operational requirements for personnel platforms, the following apply to hoisting workers using.
 - The transfer device will be used only for transferring workers.
 - The number of workers occupying the transfer device will not exceed the maximum number it was designed to hold.
 - Each worker shall wear a personal flotation device approved to the appropriate standard for industrial use.

4.23.6 Equipment set-up

- The equipment shall be uniformly level, within 1 percent of level grade, and located on footing that a qualified person has determined to be sufficiently firm and stable.
- Equipment with outriggers shall have them all extended and locked. The amount of extension shall be the same for all outriggers and in accordance with the manufacturer's procedures and load charts.

4.23.7 Equipment criteria

- Capacity – Use of suspended personnel platforms. The total load (with the platform loaded, including the hook, load line, and rigging) will not exceed 50 percent of the rated capacity for the radius and configuration of the equipment, except during proof testing.
- Capacity – Use of boom-attached personnel platforms. The total weight of the loaded personnel platform will not exceed 50 percent of the rated capacity for the radius and configuration of the equipment, except during proof testing.
- Capacity – Hoisting personnel without a personnel platform. When hoisting personnel without a personnel platform, the total load (including the hook, load line, rigging and any other equipment that imposes a load) will not exceed 50 percent of the rated capacity for the radius and configuration of the equipment, except during proof testing.

- When the occupied personnel platform is in a stationary working position, the load and boom hoist brakes, swing brakes, and operator-actuated secondary braking and locking features (such as pawls or dogs) or automatic secondary brakes shall be engaged.
- Devices.
 - Equipment (except for derricks) with a variable-angle boom shall be equipped with:
 - A boom angle indicator, readily visible to the operator.
 - A boom hoist limiting device.
 - Equipment with a luffing jib shall be equipped with:
 - A jib angle indicator, readily visible to the operator.
 - A jib hoist limiting device.
 - Equipment with telescoping booms shall be equipped with a device to indicate the boom's extended length clearly to the operator, or have measuring marks on the boom.
 - Anti-two-block. A device that automatically prevents damage and load failure from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component) shall be used. The device(s) shall prevent such damage/failure at all points where two-blocking could occur.
 - Controlled load lowering. The load line hoist drum shall have a system, other than the load line hoist brake, that regulates the lowering rate of speed of the hoist mechanism. This system or device shall be used when hoisting personnel. Free-fall of the load line hoist is prohibited. The use of equipment in which the boom hoist mechanism can free-fall is prohibited.
 - Proper operation required. Personnel hoisting operations will not begin unless the devices listed in this section are in proper working order. If a device stops working properly during such operations, the operator shall safely stop operation. Personnel hoisting operations shall not resume until the device is again working properly. Alternative measures are not permitted.
- Direct attachment of a personnel platform to a luffing jib is prohibited.

4.23.8 Personnel platform criteria

- The personnel platform and attachment/suspension system shall be designed for hoisting personnel by a qualified person familiar with structural design.
- The system used to connect the personnel platform to the equipment shall allow the platform to remain within 10 degrees of level, regardless of boom angle.
- The suspension system shall be designed to minimize tipping of the platform due to movement of workers occupying the platform.
- The personnel platform itself (excluding the guardrail system and personal fall arrest system anchorages), shall be capable of supporting, without failure, its own weight and at least five times the maximum intended load.
- All welding of the personnel platform and its components shall be performed by a certified welder familiar with the weld grades, types, and material specified in the platform design, and inspected and certified by a qualified person (e.g. professional engineer).
- Equip the personnel platform with a guardrail system that meets the requirements of *S3AM-304-PR1 Fall Protection*, and is enclosed at least from the toe-board to mid-rail with either solid construction material, or expanded metal having openings no greater than ½ inch (1.27 centimeters). Points to which personal fall arrest systems are attached shall meet the

anchorage requirements as outlined in *S3AM-304-PR1 Fall Protection*.

- Install a grab rail inside the entire perimeter of the personnel platform except for access gates/doors.
- Access gates/doors. If installed, access gates/doors of all types (including swinging, sliding, folding, or other types) will:
 - Not swing outward.
 - Be equipped with a device that prevents accidental opening.
- Confirm headroom is sufficient to allow workers to stand upright in the platform.
- In addition to the use of hard hats, protect workers by overhead protection on the personnel platform when workers are exposed to falling objects.
- All edges exposed to worker contact shall be smooth enough to prevent injury.
- Conspicuously post the weight of the platform and its rated capacity on the platform with a plate or other permanent marking.

4.23.9 Attachment and rigging

- Dedicated rigging: Do not use the rigging used for hoisting personnel for any other hoisting activities such as materials or equipment.
- Rigging hardware (including wire rope, shackles, rings, master links, and other rigging hardware) and hooks shall be capable of supporting, without failure, at least ten times the maximum intended load applied or transmitted to that component.
- Hooks and other detachable devices.
 - Hooks used in the connection between the hoist line and the personnel platform (including hooks on overhaul ball assemblies, lower load blocks, bridle legs, or other attachment assemblies or components) shall be:
 - Of a type that can be closed and locked, eliminating the throat opening.
 - Closed and locked when attached.
 - Shackles used in place of hooks shall be of the alloy anchor type, with either:
 - A bolt, nut, and retaining pin designed for the shackle, in place; or
 - Of the screw type, with the screw pin secured from accidental removal.
 - Where other detachable devices are used, they shall be of the type that can be closed and locked. Such devices shall be closed and locked when attached.
- Rope bridle. When a rope bridle is used to suspend the personnel platform, each bridle leg shall be connected to a master link or shackle in a manner that confirms that the load is evenly divided among the bridle legs.
- Fabricate eyes in wire rope slings with thimbles.
- Use bridles and associated rigging for suspending the personnel platform only for the platform and the necessary workers, their tools, and materials necessary to do their work, and do not use for any other purpose when not hoisting personnel.

4.23.10 Trial lift and inspection

- Make a trial lift with the unoccupied personnel platform loaded at least to the anticipated lift weight from ground level, or any other location where workers will enter the platform, to each location at which the platform is to be hoisted and positioned. Where there is more than one location to be reached from a single set-up position, perform either individual trial lifts for each

location, or a single trial lift for all locations.

- Perform the trial lift immediately prior to each shift in which personnel will be hoisted. In addition, repeat the trial lift prior to hoisting workers in each of the following circumstances:
 - The equipment is moved and set up in a new location or returned to a previously used location.
 - The lift route is changed, unless the competent person determines that the new route presents no new factors affecting safety.
- The competent person shall determine that:
 - Safety devices and operational aids required by this section are activated and functioning properly.
 - Nothing interferes with the crane or the personnel platform in the course of the trial lift.
 - The lift will not exceed 50 percent of the crane's rated capacity at any time during the lift.
 - The load radius to be used during the lift has been accurately determined.
- Immediately after the trial lift, the competent person shall:
 - Conduct a visual inspection of the equipment, base support or ground, and personnel platform to determine whether the trial lift has exposed any adverse effect.
 - Confirm the test weight has been removed upon the completion of the trial lift.
- Immediately prior to each lift:
 - Hoist the platform a few inches and have it inspected by a competent person to confirm that it is secure and properly balanced.
 - The following conditions shall be determined to exist by a competent person before the lift of personnel proceeds:
 - Hoist ropes are free of deficiencies in accordance with this procedure.
 - Multiple part lines are not twisted around each other.
 - The primary attachment is centered over the platform.
 - If the load rope is slack, the hoisting system shall be inspected to confirm that all ropes are properly seated on drums and in sheaves.
- Any condition found during the trial lift and subsequent inspection(s) that fails to meet a requirement of this procedure or otherwise creates a safety hazard shall be corrected before hoisting personnel.

4.23.11 Proof testing

- At each jobsite, prior to hoisting workers on the personnel platform, and after any repair or modification, the platform and rigging shall be proof-tested to 125 percent of the platform's rated capacity. The proof test may be done concurrently with the trial lift.
- The platform shall be lowered by controlled load lowering; braked; and held in a suspended position for a minimum of
- 5 minutes with the test load evenly distributed on the platform.
- After proof testing, a competent person shall inspect the platform and rigging to determine if the test has been passed. If any deficiencies are found that pose a safety hazard, the platform and rigging cannot be used to hoist personnel unless the deficiencies are corrected; the test is repeated; and a competent person determines that the test has been passed.

- Do not conduct personnel hoisting until the competent person determines that the platform and rigging have successfully passed the proof test.

4.23.12 Personnel Platform Lifting Procedures

- Personnel are only allowed to ride in a personnel platform supported by the crane load line attachment or boom-mounted platform when used in accordance with the requirements of jurisdictional regulations and standards, and the crane manufacturer's instructions. The crane may not be used for other purposes while handling personnel.
- When using equipment to hoist workers, the workers shall be in a personnel platform that meets the requirements of this procedure.
- Do not load the personnel platform in excess of its rated capacity.
- Personnel platforms will be used only for workers, their tools, and the materials necessary to do their work. Platforms shall not be used to hoist materials or tools when not hoisting personnel.
- Exception: Materials and tools to be used during the lift, if properly secured and distributed may be placed in the platform for trial lifts.
- Materials and tools shall be:
 - Secured to prevent displacement.
 - Evenly distributed within the confines of the platform while it is suspended.
- The number of workers occupying the personnel platform will not exceed the maximum number the platform was designed to hold, or the number required to perform the work, whichever is less.
- Perform the hoisting of the personnel platform in a slow, controlled, cautious manner, with no sudden movements of the equipment or the platform.
- Platform occupants shall:
 - Keep all parts of the body inside the platform during raising, lowering, and horizontal movement. This provision does not apply to an occupant of the platform when necessary to position the platform or while performing the duties of a signal person.
 - Not stand, sit on, or work from the top or intermediate rail or toe board, or use any other means/device to raise their working height.
 - Not pull the platform out of plumb in relation to the hoisting equipment.
- Before workers exit or enter a hoisted personnel platform that is not landed, the platform shall be secured to the structure where the work is to be performed, unless securing to the structure would create a greater hazard.
- If the platform is tied to the structure, the operator shall not move the platform until the operator receives confirmation that it is freely suspended.
- Use tag lines when necessary to control the platform.
- Environmental conditions.
 - Wind. When wind speed (sustained or gusts) exceeds 20 miles per hour (32 kilometers per hour) at the personnel platform, a qualified person shall determine if, in light of the wind conditions, it is not safe to lift personnel. If it is not, the lifting operation will not begin (or, if already in progress, will be terminated).
 - Other weather and environmental conditions. A qualified person shall determine if, in light of indications of dangerous weather conditions, or other impending or existing danger, it is

not safe will not begin (or, if already in progress, will be terminated).

- Workers being hoisted shall remain in direct communication with the signal person (where used), or the operator.
- Fall protection
 - Except over water, workers occupying the personnel platform shall be provided and use a personal fall arrest system. The system shall be attached to a structural member within the personnel platform.
 - The fall arrest system, including the attachment point (anchorage) shall meet the requirements of *S3AM-304-PR1 Fall Protection*.
- Other load lines
 - Do not make lifts on any other of the equipment's load lines while personnel are being hoisted, except in pile driving operations.
 - Factory-produced boom-mounted personnel platforms that incorporate a winch as original equipment: Loads are permitted to be hoisted by such a winch while workers occupy the personnel platform only where the load on the winch line does not exceed 500 pounds (227 kilograms), and does not exceed the rated capacity of the winch and platform.
- Traveling – Equipment other than derricks
 - Hoisting of workers while the equipment is traveling is prohibited.
- Traveling – Derricks.
 - Derricks are prohibited from traveling while personnel are hoisted.

4.23.13 Pre-lift meeting. A pre-lift meeting will be:

- Held to review the applicable requirements of this section and the procedures that will be followed, including the completed *S3AM-310-FM11 Personnel Platform Lifting* or equivalent.
- Attended by the equipment operator, signal person (if used for the lift), workers to be hoisted, and the person responsible for the task to be performed.
- Held prior to the trial lift at each new work location, and repeated for any workers newly assigned to the operation.

4.24 Floating Cranes/Derricks and Land Cranes/Derricks on Barges

4.24.1 This section contains supplemental requirements for floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels, or other means of flotation (vessel/flotation device). The requirements of this section do not apply when using jacked barges when the jacks are deployed to the river/lake/sea-bed, and the barge is fully supported by the jacks.

4.24.2 Additional Safety devices. In addition to the safety devices listed in this procedure, the following safety devices are required:

- Barge, pontoon, vessel, or other means of flotation list and trim device will be located in the cab; or, where there is no cab, at the operator's station.
- Horn.
- Positive equipment house lock.
- Wind speed and direction indicator. A competent person will determine if wind is a factor that needs to be considered; if so, a wind speed and direction indicator will be used.

4.24.3 Operational aids.

- An anti-two-block device is required only when hoisting personnel or hoisting over an occupied

cofferdam or shaft.

- Load weighing and similar devices (e.g., load moment (or rated capacity) indicator, load moment (or rated capacity) limiter, automatic overload prevention device, etc.) do not apply to dragline, clamshell (grapple), magnet, drop ball, container handling, concrete bucket, and pile driving equipment manufactured prior to November 8, 2011.

4.24.4 Accessibility of procedures applicable to equipment operation. If the crane/derrick has a cab, the requirements of this procedure apply. If the crane/derrick does not have a cab:

- Rated capacities (load charts) shall be posted at the operator's station. If the operator's station is moveable (such as with pendant-controlled equipment), the load charts shall be posted on the equipment.
- Procedures applicable to the operation of the equipment (other than load charts), recommended operating speeds, special hazard warnings, instructions and operators manual, shall be readily available on board.

4.24.5 Inspections. In addition to meeting the requirements of this procedure for inspecting the crane/derrick, the manager (or his/her designee) shall confirm that the barge, pontoons, vessel, or other means of flotation used to support a floating crane/derrick or land crane/derrick is inspected as follows:

- Shift. The means used to secure/attach the equipment to the vessel/flotation device shall be inspected for wear, corrosion, loose or missing fasteners, defective welds, and, where applicable, insufficient tension.
- Monthly. Inspect the vessel/flotation device used as follows:
 - The means used to secure/attach the equipment to the vessel/flotation device shall be inspected for wear, corrosion, loose or missing fasteners, defective welds, and, where applicable, insufficient tension.
 - Evidence of taking on water.
 - Deck load for proper securing.
 - Chain lockers, storage, fuel compartments and battening of hatches for serviceability as a water-tight appliance.
 - Firefighting and lifesaving equipment in place and functional.
- The shift and monthly inspections shall be conducted by a competent person. If any deficiency is identified, an immediate determination will be made by a qualified person as to whether the deficiency constitutes a hazard. If the deficiency is determined to constitute a hazard, the vessel/flotation device shall be removed from service until it has been corrected.
- Annual: External vessel/flotation device inspection.
 - The external portion of the barge, pontoons, vessel, or other means of flotation used shall be inspected annually by a qualified person who has expertise with respect to vessels/flotation devices. The inspection shall include the following items:
 - The items identified in requirements of this section.
 - Cleats, bitts, chocks, fenders, capstans, ladders, and stanchions for significant corrosion, wear, deterioration, and deformation.
 - External evidence of leaks and structural damage.
 - Four-corner draft readings.
 - Firefighting equipment for serviceability.

- Rescue skiffs, lifelines, work vests, life preservers and ring buoys shall be inspected for proper condition.
 - If any deficiency is identified, an immediate determination will be made by the qualified person as to whether the deficiency constitutes a hazard; or, although not yet a hazard, needs to be monitored in the monthly inspections. If the deficiency is determined to constitute a hazard, the vessel/flotation device shall be removed from service until it has been corrected.
 - If the qualified person determines that, although not currently a hazard, the deficiency needs to be monitored, the manager (or his/her designee) shall confirm that the deficiency is checked in the monthly inspections.
 - Quadrennial: Internal vessel/flotation device inspection:
 - The internal portion of the barge, pontoons, vessel, or other means of flotation used shall be surveyed once every 4 years by a marine engineer, marine architect, licensed surveyor, or other qualified person who has expertise with respect to vessels/flotation devices.
 - If any deficiency is identified, an immediate determination will be made by the surveyor as to whether the deficiency constitutes a hazard; or, although not yet a hazard, needs to be monitored in the monthly inspections as appropriate.
 - If the deficiency is determined to constitute a hazard, the vessel/flotation device shall be removed from service until it has been corrected.
 - If the surveyor determines that, although not currently a hazard, the deficiency needs to be monitored, the manager (or his/her designee) shall confirm that the deficiency is checked in the monthly or annual inspections as appropriate.
 - Documentation. The required monthly, annual and quadrennial inspections shall be documented in accordance with this procedure. The quadrennial inspection shall be retained for a minimum of 4 years.
- 4.24.6 Working with a diver. The following additional requirements apply when working with a diver in the water:
- If a crane/derrick is used to get a diver into and out of the water, it cannot be used for any other purpose until the diver is back on board. When used for more than one diver, it cannot be used for any other purpose until all divers are back on board.
 - The operator shall remain at the controls of the crane/derrick at all times.
 - In addition to the signal requirements in this procedure; either:
 - A clear line of sight shall be maintained between the operator and tender of the diver, or
 - The signals between the operator and tender of the diver shall be transmitted electronically.
 - The means used to secure the crane/derrick to the vessel/flotation device cannot allow any amount of shifting in any direction.
- 4.24.7 The manager (or his/her designee) shall confirm that the manufacturer's specifications and limitations with respect to environmental, operational, and in-transit load for the barge, pontoons, vessel, or other means of flotation are not exceeded or violated.
- 4.24.8 Floating cranes/derricks. For equipment designed by the manufacturer (or manager or his/her designee) for marine use by permanent attachment to barges, pontoons, vessels, or other means of flotation:
- Load Charts

- The manufacturer's load charts applicable to operations on water cannot be exceeded. When using these charts, the manager (or his/her designee) shall comply with all parameters and limitations (such as dynamic/environmental parameters) applicable to the use of the charts.
- The load charts will take into consideration a minimum wind speed of 40 miles per hour (64 kilometers per hour).
- The requirements for maximum allowable list and maximum allowable trim as specified below shall be met.

Rated Capacity	Maximum Allowable List	Maximum Allowable Trim
Equipment designed for marine use by permanent attachment (other than derricks):		
25 tons or less	5 degrees	5 degrees
Over 25 tons	7 degrees	7 degrees
Derricks designed for marine use by permanent attachment:		
Any rated capacity	10 degrees	10 degrees

- If the equipment is manager (or his/her designee)-made, it is not permitted to be used unless the manager (or his/her designee) has documents demonstrating that the load charts and applicable parameters for use meet the requirements of this section. Such documents shall be signed by a registered professional engineer who is a qualified person with respect to the design of this type of equipment (including the means of flotation).
- The barge, pontoons, vessel, or other means of flotation used shall:
 - Be structurally sufficient to withstand the static and dynamic loads of the crane/derrick when operating at the crane/derricks' maximum-rated capacity with all anticipated deck loads and ballasted compartments.
 - Have a subdivided hull with one or more longitudinal watertight bulkheads for reducing the free-surface effect.
 - Have access to void compartments to allow for inspection and pumping.

4.24.9 Land cranes/derricks. For land cranes/derricks used on barges, pontoons, vessels, or other means of flotation:

- The rated capacity of the equipment (load charts) applicable for use on land shall be reduced to:
 - Account for increased loading from list, trim, wave action, and wind.
 - Be applicable to a specified location(s) on the specific barge, pontoons, vessel, or other means of flotation that will be used, under the expected environmental conditions.
- The rated capacity modification shall be done by the equipment manufacturer, or a qualified person who has expertise with respect to both land crane/derrick capacity, and the stability of vessels/flotation devices.
- List and trim.
 - The maximum allowable list and the maximum allowable trim cannot exceed the least of the following: 5 degrees, the amount specified by the crane/derrick manufacturer; or, where an amount is not so specified, the amount specified by the qualified person.
 - The maximum allowable list and the maximum allowable trim for the barge, pontoon,

vessel, or other means of flotation cannot exceed the amount necessary to confirm that following conditions are met:

- All deck surfaces of the barge, pontoons, vessel, or other means of flotation used shall be above water.
- The entire bottom area of the barge, pontoons, vessel, or other means of flotation used shall be submerged.
- Physical attachment, corraling, rails system, and centerline cable system. The manager (or his/her designee) shall meet the requirements in Option 1, Option 2, Option 3, or Option 4, as follows.
 - Option 1 – Physical attachment. The crane/derrick shall be physically attached to the barge, pontoons, vessel, or other means of flotation. Methods of physical attachment include crossed-cable systems attached to the crane/derrick and vessel flotation device (this type of system allows the crane/derrick to lift up slightly from the surface of the vessel/means of flotation), bolting or welding the crane/derrick to the vessel/flotation device, strapping the crane/derrick to the vessel/flotation device with chains, or other methods of physical attachment.
 - Option 2 – Corraling. The crane/derrick shall be prevented from shifting by installing barricade restraints (a corraling system). Corraling systems shall not allow any amount of shifting in any direction by the equipment.
 - Option 3 – Rails. The crane/derrick shall be prevented from shifting by being mounted on a rail system. Rail clamps and rail stops are required unless the system is designed to prevent movement during operation by other means.
 - Option 4 – Centerline cable system. The crane/derrick shall be prevented from shifting by being mounted to a wire rope system. The wire rope system shall meet the following requirements:
 - The wire rope and attachments shall be of sufficient size/strength to support the side load of crane/derrick.
 - The wire rope shall be physically attached to the vessel/flotation device.
 - The wire rope shall be attached to the crane/derrick by appropriate attachment methods (such as shackles or sheaves) on the undercarriage, which will allow the crew to secure the crane/derrick from movement during operation, and to move the crane/derrick longitudinally along the vessel/flotation device for repositioning.
 - A method will be employed to prevent the crane/derrick from passing the forward or aft end of the wire rope attachments.
 - The crane/derrick shall be secured from movement during operation.
 - Whichever Option is used, the systems/means used to comply with the Option will be designed by a marine engineer, registered professional engineer familiar with floating crane/derrick design, or qualified person familiar with floating crane/derrick design.
 - Exception. For mobile auxiliary cranes used on the deck of a floating crane/derrick, the requirement to use Option 1, Option 2, Option 3, or Option 4 of this section does not apply where the manager (or his/her designee) demonstrates implementation of a plan and procedures that meet the following requirements:
 - A marine engineer or registered professional engineer familiar with floating crane/derrick design develops and signs a written plan for the use of the mobile auxiliary crane.
 - The plan shall be designed so that the applicable requirements of this section will be

met despite the position, travel, operation, and lack of physical attachment (or corralling, use of rails, or cable system) of the mobile auxiliary crane.

- The plan shall specify the areas of the deck where the mobile auxiliary crane is permitted to be positioned, travel, and operate, and the parameters/limitations of such movement and operation.
- The deck shall be marked to identify the permitted areas for positioning, travel, and operation.
- The plans all specify the dynamic/environmental conditions that shall be present for use of the plan. If the specified dynamic/environmental conditions are exceeded, the mobile auxiliary crane shall be physically attached or corralled in accordance with Option 1, Option 2, Option 3, or Option 4.
- The barge, pontoons, vessel, or other means of flotation used shall:
 - Be structurally sufficient to withstand the static and dynamic loads of the crane/derrick when operating at the crane/derrick's maximum rated capacity with all anticipated deck loads and ballasted compartments.
 - Have a subdivided hull with one or more longitudinal watertight bulkheads for reducing the free surface effect.
 - Have access to void compartments to allow for inspection and pumping.

4.25 Dedicated pile drivers.

- 4.25.1 The provisions of this procedure apply to dedicated pile drivers, except as specified in this section.
- 4.25.2 Information provided elsewhere in this standard on anti two-block devices does not apply.
- 4.25.3 Operator Qualification and Certification applies, except that the qualification or certification will be for operation of either dedicated pile drivers, or equipment that is the most similar to dedicated pile drivers.
- 4.25.4 The industrial site or project specific SH&E Plan shall include minimum safe work distances for workers adjacent to all pile driving operations.
 - At a minimum, employees shall maintain a distance of at least two pile lengths from where piles are being cut and dropped, other than in situations where cut piles are being guided to the ground utilizing mechanical means (e.g., pile driver and shackle) to control the direction and speed of fall of the cut pile.

4.26 Overhead and Gantry Cranes

- 4.26.1 The requirements of this procedure apply to the following equipment when used in construction: Overhead and gantry cranes, including semi-gantry, cantilever gantry, wall cranes, storage bridge cranes, and others having the same fundamental characteristics.

4.27 Derricks

- 4.27.1 This section contains supplemental requirements for derricks, whether temporarily or permanently mounted; all sections of this procedure apply to derricks unless specified otherwise. A derrick is powered equipment consisting of a mast or equivalent member that is held at or near the end by guys or braces, with or without a boom, and its hoisting mechanism. The mast/equivalent member and/or the load are moved by the hoisting mechanism (typically base-mounted) and operating ropes. Derricks include A-frame, basket, breast, Chicago boom, gin pole (except gin poles used for erection of communication towers), guy, shear leg, and variations of such equipment.
- 4.27.2 Operation of Derricks
 - "Operation" applies except for "accessibility of procedures".

- Load chart contents. Load charts shall contain at least the following information:
 - Rated capacity at corresponding ranges of boom angle or operating radii.
 - Specific lengths of components to which the rated capacities apply.
 - Required parts for hoist reeving.
 - Size and construction of rope will be included on the load chart or in the operating manual.
- Load chart location.
 - Permanent installations. For permanently installed derricks with fixed lengths of boom, guy, and mast, a load chart shall be posted where it is visible to personnel responsible for the operation of the equipment.
 - Non-permanent installations. For derricks that are not permanently installed, the load chart shall be readily available at the job site to personnel responsible for the operation of the equipment.

4.27.3 Construction of Derricks

- General requirements
 - Derricks shall be constructed to meet all stresses imposed on members and components when installed and operated in accordance with the manufacturer's/builder's procedures, and within its rated capacity.
 - Welding of load-sustaining members shall conform to recommended practices of the applicable jurisdictional standard (e.g. ANSI, CSA).
- Guy derricks.
 - The minimum number of guys will be six, with equal spacing, except where a qualified person or derrick manufacturer approves variations from these requirements and revises the rated capacity to compensate for such variations.
 - Guy derricks will not be used unless the manager (or his/her designee) has the following guy information:
 - The number of guys.
 - The spacing around the mast.
 - The size, grade, and construction of rope to be used for each guy.
 - For guy derricks manufactured after December 18, 1970 the manager (or his/her designee) shall have the following additional guy information:
 - The amount of initial sag or tension.
 - The amount of tension in guy line rope at anchor.
 - The mast base shall permit the mast to rotate freely, with allowance for slight tilting of the mast caused by guy slack.
 - The mast cap shall:
 - Permit the mast to rotate freely.
 - Withstand tilting and cramping caused by the guy loads.
 - Be secured to the mast to prevent disengagement during erection.
 - Be provided with means for attaching guy ropes.
- Stiff leg derricks.

- The mast will be supported in the vertical position by at least two stiff legs: one end of each will be connected to the top of the mast, and the other end securely anchored.
- The stiff legs shall be capable of withstanding the loads imposed at any point of operation within the load chart range.
- The mast base shall:
 - Permit the mast to rotate freely (when necessary).
 - Permit deflection of the mast without binding.
- The mast shall be prevented from lifting out of its socket when the mast is in tension.
- The stiff leg connecting member at the top of the mast shall:
 - Permit the mast to rotate freely (when necessary).
 - Withstand the loads imposed by the action of the stiff legs.
 - Be secured so as to oppose separating forces.
- Gin pole derricks.
 - Guy lines shall be sized and spaced so as to make the gin pole stable in both boomed and vertical positions. Exception: Where the size and/or spacing of guy lines do not result in the gin pole being stable in both boomed and vertical positions, the manager (or his/her designee) shall confirm that the derrick is not used in an unstable position.
 - The base of the gin pole shall permit movement of the pole (when necessary).
 - The gin pole shall be anchored at the base against horizontal forces (when such forces are present).
- Chicago boom derricks. The fittings for stepping the boom and for attaching the topping lift shall be arranged to:
 - Allow the derrick to swing at all permitted operating radii and mounting heights between fittings.
 - Accommodate attachment to the upright member of the host structure.
 - Withstand the forces applied when configured and operated in accordance with the manufacturer's/builder's procedures, and within its rated capacity.
 - Prevent the boom or topping lift from lifting out under tensile forces.

4.27.4 Anchoring and guying of derricks

- Load anchoring data developed by the manufacturer or a qualified person shall be used.
- Guy derricks.
 - Anchor the mast base.
 - Secure the guys to the ground or other firm anchorage.
 - Design the anchorage and guying to withstand maximum horizontal and vertical forces encountered when operating within rated capacity with the particular guy slope and spacing specified for the application.
- Stiff Leg derricks.
 - Anchor the mast base and stiff legs.
 - Design the anchorage and guying to withstand maximum horizontal and vertical forces encountered when operating within rated capacity with the particular stiff leg spacing and

slope specified for the application.

4.27.5 Swingers and hoists

- The boom, swinger mechanisms, and hoists shall be suitable for the derrick work intended, and shall be anchored to prevent displacement from the imposed loads.
- Base-mounted drum hoists.
 - Base-mounted drum hoists shall meet the requirements specified by the applicable jurisdictional regulations and/or standards.
 - Load tests for new hoists. The manager (or his/her designee) shall confirm that new hoists are load tested to a minimum of 110 percent of rated capacity, but not more than 125 percent of rated capacity, unless otherwise recommended by the manufacturer. This requirement is met where the manufacturer has conducted this testing.
 - Repaired or modified hoists. Hoists that have had repairs, modifications, or additions affecting their capacity or safe operation shall be evaluated by a qualified person to determine if a load test is necessary.
 - Load test procedure. Required load tests shall be conducted as follows:
 - Hoist the test load a vertical distance to assure that the load is supported by the hoist and held by the hoist brake(s).
 - The test load will be lowered, stopped, and held with the brake(s).
 - Do not use the hoist unless a competent person determines that the test has been passed.

4.27.6 Operational Aids for derricks

- Operational Aids requirements identified in this procedure apply, except for “Boom hoist limiting device” and “Boom angle or radius indicator” and “Load weighing and similar devices.”
- Boom angle aid. The manager (or his/her designee) shall confirm that either:
 - The boom hoist cable is marked with caution and stop marks. The stop marks correspond to maximum and minimum allowable boom angles. The caution and stop marks are in view of the operator, or a spotter who is direct communication with the operator; or
 - An electronic or other device that signals the operator in time to prevent the boom from moving past its maximum and minimum angles, or automatically prevents such movement, is used.
- Load weight/capacity devices. Derricks manufactured more than 1 year after November 8, 2010 with a maximum rated capacity over 6,000 pounds shall have at least one of the following: load weighing device, load moment indicator, rated capacity indicator, or rated capacity limiter. Temporary alternative measures: the weight of the load shall be determined from a reliable source (such as the load’s manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per-foot weight), or by other equally reliable means. This information will be provided to the operator prior to the lift.

4.27.7 Post-assembly approval and testing – new or reinstalled derricks

- Anchorages
 - Anchorages, including the structure to which the derrick is attached (if applicable), shall be approved by a qualified person.
 - If using a rock or hairpin anchorage, the qualified person shall determine if any special testing of the anchorage is needed. If so, it will be tested accordingly.

- Functional test. Prior to initial use, new or reinstalled derricks shall be tested by a competent person with no hook load to verify proper operation. This test shall include:
 - Lifting and lowering the hook(s) through the full range of hook travel.
 - Raising and lowering the boom through the full range of boom travel.
 - Swinging in each direction through the full range of swing.
 - Actuating the anti-two-block and boom-hoist-limit devices (if provided).
 - Actuating locking, limiting, and indicating devices (if provided).
 - Load test. Prior to initial use, new or reinstalled derricks shall be load tested by a competent person. The test load shall meet the following requirements:
 - Test loads shall be at least 100 percent, and no more than 110 percent, of the rated capacity, unless otherwise recommended by the manufacturer or qualified person, but in no event shall the test load be less than the maximum anticipated load.
 - The test shall consist of:
 - Hoisting the test load a few inches and holding to verify that the load is supported by the derrick and held by the hoist brake(s).
 - Swinging the derrick, if applicable, the full range of its swing, at the maximum allowable working radius for the test load.
 - Lowering, stopping, and holding the load with the brake(s).
 - The derrick is not permitted to be used unless the competent person determines that the test has been passed.
 - Documentation. Tests conducted under this paragraph will be documented. The document will be retained until the derrick is re-tested or dismantled, whichever occurs first.
- 4.27.8 Load testing repaired or modified derricks. Derricks that have had repairs, modifications for additions affecting the derrick's capacity or safe operation shall be evaluated by a qualified person to determine if a load test is necessary. If it is, load testing shall be conducted and documented.
- 4.27.9 Power failure procedures. If power fails during operations, the derrick operator shall safely stop operations. This includes:
- Setting all brakes or locking devices.
 - Moving all clutch and other power controls to the off position.
- 4.27.10 Use of winch heads
- Do not handle ropes on a winch head without the knowledge of the operator.
 - While a winch head is being used, the operator shall be within reach of the power unit control lever.
- 4.27.11 Securing the boom
- When the boom is being held in a fixed position, engage dogs, pawls, or other positive holding mechanisms on the boom hoist.
 - When taken out of service for 30 days or more, secure the boom by one of the following methods:
 - Lay it down.
 - Secure it to a stationary member, as nearly under the head as possible, by attachment of a sling to the load block.

- For guy derricks, lift to a vertical position and secure to the mast.
- For stiff leg derricks, secure against the stiff leg.

4.27.12 The process of jumping the derrick shall be supervised by the A/D supervisor.

4.27.13 Derrick operations shall be supervised by a competent person.

4.27.14 Inspections. In addition to the requirements in this procedure, the following additional items shall be included in the inspections of derricks:

- Daily: Guys for proper tension.
- Annual:
 - Gudgeon pin for cracks, wear, and distortion.
 - Foundation supports for continued ability to sustain the imposed loads.

4.28 Side-Boom Cranes and Boom-Truck Procedures

4.28.1 Prior to the manipulation of any controls, operators are to confirm that all personnel are clear of all moving parts.

4.28.2 The operator is in control of all operations associated with side-boom crane or boom truck.

4.28.3 The boom truck operator shall confirm the THA and boom truck hazard checklist have been performed and reviewed and signed by all parties prior to working with boom truck. Refer to *S3AM-310-FM10 Boom Truck Checklist*.

4.28.4 Only approved access and egress points on/off the bed of the truck shall be used.

4.29 Equipment with Rated Hoisting/Lifting Capacity of 2,000 pounds (907 kilograms) or less.

4.29.1 The manager shall confirm the operator is trained and competent to operate lifting equipment.

4.29.2 Proper planning shall be conducted, including, but not limited to:

- Complete a THA for the proposed task.
- Inspect the lifting equipment pre-operation and in accordance with manufacturer specifications.
- Accurately establish load weight, including rigging equipment, and confirming it is within the lifting capacity of the lifting equipment.
- Assess weather conditions for potential impacts and ground conditions for stability and levelness.
- As applicable, select appropriate wire rope, install properly and inspect according to this procedure.
- Verify the presence of and proper operation of manufacturer supplied safety devices.
- Adequately identify work area to prevent unauthorized entry.
- Where overhead power lines are present, conduct operations in accordance with this procedure.

4.29.3 Operators shall comply with all the manufacturer's procedures applicable to the operational functions of equipment, including its use with attachments.

5.0 Records

5.1 All training records shall be maintained in accordance with *S3AM-003-PR1 SH&E Training*.

5.2 All inspection records will be maintained on site with the machine. This will include, but not be limited to:

- Equipment inspections;

- Equipment tests; and
- Repairs, modifications and/or maintenance of the lifting device.

5.3 Critical Lift Plans, signed off Assembly – Disassembly Procedures, Lift Classifications and any other documentation completed relating to the lifting tasks shall be maintained in the program or project files.

6.0 Attachments

- 6.1 [S3AM-310-ATT1](#) [Definitions](#)
- 6.2 [S3AM-310-ATT2](#) [Standard Hand Signals](#)
- 6.3 [S3AM-310-ATT3](#) [Rigging](#)
- 6.4 [S3AM-310-ATT4](#) [Wire Rope Safety Factors](#)
- 6.5 [S3AM-310-FM1](#) [Initial & Annual Crane Inspection](#)
- 6.6 [S3AM-310-FM2](#) [Lift Classification](#)
- 6.7 [S3AM-310-FM3](#) [Critical Lift Plan](#)
- 6.8 [S3AM-310-FM4](#) [Daily Crane Inspection](#)
- 6.9 [S3AM-310-FM5](#) [Monthly Crane Inspection](#)
- 6.10 [S3AM-310-FM6](#) [Monthly Wire Rope / Hook Inspection](#)
- 6.11 [S3AM-310-FM7](#) [Monthly Synthetic Sling Inspection](#)
- 6.12 [S3AM-310-FM8](#) [Monthly Shackle Inspection](#)
- 6.13 [S3AM-310-FM9](#) [Monthly Rigging Inspection](#)
- 6.14 [S3AM-310-FM10](#) [Boom Truck Checklist](#)
- 6.15 [S3AM-310-FM11](#) [Personnel Platform Lifting](#)
- 6.16 [S3AM-310-FM12](#) [Assembly – Disassembly Procedure](#)

Americas

Diving

S3AM-334-PR1

1.0 Purpose and Scope

- 1.1 Establishes the requirements to confirm the safety of AECOM employees who engage in scientific diving for AECOM projects and activities.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations.
- 1.3 Underwater activities involving welding, movement or placement of heavy equipment, inspection of structures, or other activities typically associated with commercial diving operations are prohibited under the guidance of this procedure.
- 1.4 Diving operations conducted by AECOM employees outside the parameters of this procedure require approval of the appropriate Business Group Vice President of Safety, Health and Environment (SH&E). Associated procedures shall be developed for the proposed diving operations along with an in-depth and comprehensive SH&E Plan.
- 1.5 Scientific diving is permitted under specified conditions, and is exempted from the normal commercial diving rules under United States Regulations in Title 29 Code of Federal Regulations 1910, Subpart T. However, scientific diving conducted outside the United States (Canada, Mexico, and other Latin America countries) must be performed according to the jurisdictional requirements, which in some cases fall under commercial diving rules. This will require a case-by-case evaluation, managed through the Dive Operations Plans in accordance with S3AM-334-ATT1 *Standards for Scientific Diving* and be approved by the Diving Control Board (DCB) and the applicable Business Group Vice President of Safety, Health and Environment (SH&E).

2.0 Terms and Definitions

- 2.1 **American Academy for Underwater Sciences (AAUS)** – A consensus standard for scientific diving conducted under the jurisdiction of the United States of America. AECOM shall perform scientific diving in the United States in accordance with the AAUS Standard for Scientific Diving.
- 2.2 **Canadian Association for Underwater Science (CAUS)** – A non-profit, all volunteer organization with a mandate for promoting safe diving practices and developing peer-reviewed standards of practice for scientific diving by its members.

The Canadian Standards Association (CSA) has excluded scientific diving from both its *Operational safety code for diving operations* (CSA-Z275.2) and *Competency Standard for Diving Operations* (CSA-Z275.4), and refers divers engaged in scientific diving to the CAUS *Standard of Practice for Scientific Diving*.

Where diving legislation is in place in provincial or territorial occupational health and safety regulations within Canada, it has precedence over the CAUS *Standard*, and that if the *Standard* is referenced in legislation it has the force of law.

- 2.3 **Diving Control Board (DCB)** – The group of individuals who act as the official representative of AECOM in matters concerning the scientific diving program. The majority of board shall be active AECOM scientific divers. See S3AM-334-ATT1 *Standards for Scientific Diving* for the current board members.
- 2.4 **EM-385-1-1** – The U.S. Army Corp of Engineers Safety and Health Requirements Manual. Chapter 30 of this manual describes requirements for underwater diving for all Federal Government Department of Defense work. AECOM's scientific diving program shall substantially meet the requirements of EM 385-1-1, chapter 30.
- 2.5 **Scientific Diving** – Scientific diving is diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks.

3.0 References

Diving (S3AM-334-PR1)
Revision 1 December 15, 2016

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- 3.1 S3AM-004-PR1 Incident Reporting, Notifications & Investigation
- 3.2 S3AM-209-PR1 Risk Assessment & Management
- 3.3 S3AM-315-PR1 Working On & Near Water
- 3.4 S3AM-333-PR1 Marine Safety & Vessel Operations

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Manager

- Responsible for the overall success of a project and the performance of employees engaged in project activities.
- Determine the applicability of this Procedure during the planning stage of the field investigation projects.
- Allocate appropriate resources to implement the required measures.
- Refer to *S3AM-334-ATT1 Standards for Scientific Diving* for additional roles and responsibilities.

4.1.2 SH&E Manager

- Responsible for providing support to the Project Manager and his/her designee in evaluation of safety and health risks and identification of applicable policies and procedures and appropriate precautions.
- Responsible for providing support to the Diving Safety Officer (DSO). Refer to *S3AM-334-ATT1 Standards for Scientific Diving*.
- Support on the implementation of the required elements of this Procedure and *S3AM-334-ATT1 Standards for Scientific Diving*.

4.1.3 Responsible Administrator Officer (RAO)

- The Responsible Administrative Officer (RAO) serves as a member of the DCB. This person should function as a high-level liaison between the AECOM scientific diving team and the greater AECOM organization. Refer to *S3AM-334-ATT1 Standards for Scientific Diving* for roles and responsibilities.

4.1.4 Diving Safety Officer (DSO)

- Serves as a member of the AECOM Dive Control Board (DCB). This person should have broad technical and scientific expertise in research-related diving and shall maintain the required qualifications. Refer to *S3AM-334-ATT1 Standards for Scientific Diving*.
- Will be responsible to the AECOM DCB for the conduct of the scientific diving program of AECOM. The routine operational authority for this program, including the conduct of training and certification, approval of Dive Operations Plans, maintenance of diving records, and ensuring compliance with this standard and all relevant regulations of the membership organization, rests with the AECOM DSO.
- Will review all proposed AECOM scientific diving projects or subtasks during the risk assessment phase of all work proposals or scope modifications.
- May permit portions of this program to be carried out by a qualified delegate, although the DSO may not delegate responsibility for the safe conduct of a local diving program. The DSO will direct all local qualified delegates in their assigned responsibilities. Qualified delegates will be assigned only those responsibilities they are competent to oversee as described in this manual.
- Will submit all responsibilities proposed for qualified delegates to the AECOM DCB for approval. Where authorized, a letter outlining all approved responsibilities will be sent to a

qualified delegate and documented in the qualified delegates' diver file. Qualified delegates who are approved to conduct scientific diver initial check-out dives, review Dive Operations Plans (DOP), serve as a Dive Supervisor (DS) for AECOM diving projects, organize diver files for local AECOM offices, and conduct trainings in data gathering techniques, will be designated an Assistant DSO.

- Will be guided in the performance of the required duties by the advice of the DCB, but day-to-day responsibility for the conduct of the local diving programs will be retained by the DSO.
- Will certify the depths to which a diver has been trained.
- Shall suspend diving operations considered to be unsafe or unwise.

4.1.5 Dive Control Board (DCB)

A DCB shall be setup for the Americas Scientific Diving Program. The DCB shall consist of a majority of active AECOM scientific divers. Refer to *S3AM-334-ATT1 Standards for Scientific Diving* for the roles and responsibilities of the DCB.

4.1.6 Divers and Dive Team

- Responsible for complying with this procedure and with *S3AM-334-ATT1 Standards for Scientific Diving*.
- Includes Lead Diver/Dive Supervisor, Safety Diver, Divers Attendant, Site Safety Officer, Project Manager, etc.
- Refer to *S3AM-334-ATT1 Standards for Scientific Diving* for roles and responsibilities of the various Dive Team members.

4.2 Medical Requirements

4.2.1 General

AECOM shall determine that **divers** have passed a current diving physical examination and have been declared in writing by the examining physician to be fit to engage in diving activities as may be limited or restricted in the medical evaluation report.

4.2.2 Information Provided Examining Physician

The organizational member shall provide a copy of the medical evaluation requirements as provided in *S3AM-334-ATT1 Standards for Scientific Diving* to the examining physician.

4.2.3 Frequency of Medical Evaluations

Medical Examinations shall be in compliance with the appropriate jurisdictional Standards for Scientific Divers (e.g. AAUS, CAUS, CSA).

4.3 Required Documents

4.3.1 This SOP is supplemented by *S3AM-334-ATT1 Standards for Scientific Diving* and will be supplemented by a project-specific Safe Work Plan (SWP) / Dive Operations Plan (DOP), refer also to *S3AM-209-PR Project Hazard Assessment and Planning*.

4.3.2 A SWP or DOP shall be prepared for each dive operation. The SWP or DOP shall integrate the elements of:

- *S3AM-334-ATT1 Standards for Scientific Diving*,
- An Emergency Action Plan, and
- Diver qualifications for the operation.

4.4 Refusal to Dive / Termination of a Dive

4.4.1 The decision to dive is that of the diver. A diver may refuse to dive or terminate a dive, without fear of penalty, whenever they feel it is unsafe for them or any member of the dive team to make the dive.

- 4.4.2 Refer to *S3AM-334-ATT1 Standards for Scientific Diving*.
- 4.5 Emergencies and Deviations from Procedures
 - 4.5.1 Any diver may deviate from the requirements of this procedure and that of *S3AM-334-ATT1 Standards for Scientific Diving* to the extent necessary to prevent or minimize a situation that is likely to cause death, serious physical harm or major environmental damage.
 - 4.5.2 Refer to *S3AM-334-ATT1 Standards for Scientific Diving*.
- 4.6 Dive and Post-Dive Procedures
 - 4.6.1 Dive procedures and post-dive procedures shall conform to the requirements and restrictions contained in *S3AM-334-ATT1 Standards for Scientific Diving*.
- 4.7 Required Incident Reporting
 - 4.7.1 AECOM's procedures for incident reporting shall be followed, refer to *S3AM-004-PR Incident Reporting, Notifications & Investigation* in addition to any required reporting given the jurisdictional requirements (e.g. AAUS, CAUS). Refer to *S3AM-334-ATT1 Standards for Scientific Diving*.
- 4.8 Records
 - 4.8.1 Dive records include personal diver records (e.g. certifications, logs, training, evidence of fitness, etc.), project-specific dive records, incident reports, annual report, equipment maintenance records, etc. Refer to *S3AM-334-ATT1 Standards for Scientific Diving*.
- 4.9 Record Maintenance
 - 4.9.1 The DCB shall maintain records in accordance with *S3AM-334-ATT1 Standards for Scientific Diving*.

5.0 Attachments

- 5.1 [S3AM-334-ATT1 Standards for Scientific Diving](#)

Hand & Power Tools

S3AM-305-PR1

1.0 Purpose and Scope

- 1.1 This procedure provides the AECOM requirements for all manually operated hand and power tools and associated use, handling and storage. These requirements apply to tools provided by AECOM for employee use as well as tools provided by employees for use on AECOM work sites.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

- 2.1 None

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-118-PR1 Hearing Conservation
- 3.3 S3AM-208-PR1 Personal Protective Equipment
- 3.4 S3AM-302-PR1 Electrical Safety
- 3.5 S3AM-325-PR1 Lockout Tagout

4.0 Procedure

- 4.1 Roles and Responsibilities
 - 4.1.1 **Managers/Supervisors**
 - Ensure that all aspects of this procedure are followed and adhered to on all AECOM projects, sites and locations.
 - If a specific tool is not included in the work instructions related to this procedure, appropriate guidelines shall be established prior to work associated with that tool, including following manufacturer's recommendations.
 - Ensure compliance with applicable client requirements and restrictions regarding hand or power tools.
 - 4.1.2 **Safety, Health and Environment (SH&E) Manager**
 - Provide technical guidance and support as to this procedure and associated work instructions.
 - 4.1.3 **Employees**
 - Work only with tools for which they are appropriately trained and familiar with.
 - Follow manufacturer's recommendations for its use and never modify the equipment without first obtaining authorization from the manufacturer.
 - Comply with applicable client requirements and restrictions regarding hand or power tools.
- 4.2 Requirements
 - 4.2.1 Always conduct a task hazard assessment (THA) prior to work commencing and include the identified hazards associated with the anticipated tool use.
 - 4.2.2 No employee shall use any hand or power tool, unless they are familiar with the use and operation of the equipment or have received specific instruction on its use and operation.

- 4.2.3 All tools will be used for which they were designed and in accordance with manufacturer's specifications. Do not use tools for jobs they are not intended for. For example, do not use a slot screw driver as a chisel, pry bar, wedge or punch or wrenches as hammers.
- 4.2.4 Use approved tools only. Never modify or use makeshift tools.
- 4.2.5 Do not apply excessive force or pressure on tools unless permitted by the manufacturer's specifications. This includes additional force by hammering with body weight, foot or other tools.
- 4.2.6 Keep surfaces and handles clean and free of excess oil and grease to prevent slipping.
- 4.2.7 Do not carry sharp tools (e.g. knife, chisel, screwdriver, etc.) in pockets; this practice may cause puncture wounds.
- 4.2.8 All tools shall be properly maintained. Clean, dry, lubricate and repair tools as applicable, and return to a suitable toolbox, room, rack, or other storage area upon completion of a job.
- 4.2.9 Ensure proper ergonomics principles are observed when using hand and power tools, such as but not limited to:
 - Avoid static and awkward positions when possible.
 - Move at intervals to reduce muscle fatigue.
 - Consider tools with a trigger strip, rather than a trigger button. This strip will allow the exertion of more force over a greater area of the hand that, in turn, will reduce muscle fatigue
 - Do not apply excessive force or pressure on tools.
 - If possible use tools with comfortable grips that are designed to allow the wrist to stay straight. Avoid using a bent wrist.
 - Choose hand tools that have a centre of gravity within or close to the handle.
 - Frequently used tools that weigh more than 1 pound (0.45 kilograms) should be counter-balanced.
 - Ensure proper body positioning when using a tool to prevent slips or falls in the event of unanticipated tool behaviour (slip, kickback, etc.). Avoid over-reaching.
 - Pull on tools such as a wrench or pliers whenever possible. Loss of balance is more likely when pushing if the tool slips. If pushing is necessary, hold the tool with an open palm.
 - Hand-arm vibration exposure is associated with the use of hand tools.
 - Reduce power to the lowest setting that can complete the job safely. This action reduces tool vibration at the source.
 - Consider the need for controls such as limiting time of use.
 - If safe to do so, adjust to a looser but stable grip, and use anti-vibration gloves.
 - Use of heavy tools such as jackhammers can cause fatigue and strains. Heavy rubber grips can reduce these effects by providing a secure handhold.
 - Do not increase a tool's leverage by adding sleeved additions (e.g. a pipe or snipe) to increase tool handle length.
- 4.2.10 Avoid placing fingers and hands in danger zones:
 - Ensure hands and fingers have sufficient clearance in the event the tool slips.
 - Ensure stability of the work-piece. Use work-piece holders (e.g. vise, chisel holder, etc.) whenever possible to prevent injury to hands or deflection of tool or work-piece.
 - Use push sticks or guides when cutting or machining smaller material.

- 4.2.11 Secure tools when working from heights to prevent them from falling. Never leave tools on ladders, scaffolds, or overhead work areas when they are not in use.
- 4.2.12 Utilize good housekeeping practices to ensure tools do not present a tripping hazard.
- 4.2.13 Ensure no part of a tool extends over the edge of the bench top. Place sharp tools (e.g., saws, chisels, knives) on benches so that sharp points or edges face away from the edge.
- 4.2.14 When using saw blades, knives, or other tools, if possible direct the tools away from aisle areas and away from other employees working in close proximity.
- 4.2.15 Do not throw tools from place to place or from person to person, or drop tools from heights. Hand them, handle first, directly to other workers.
- 4.2.16 Use non-sparking and intrinsically safe tools in atmospheres with flammable or explosive characteristics and where highly volatile liquids, and other explosive substances are stored or used.
 - Iron or steel hand tools may produce sparks that can be an ignition source around flammable substances. Where this hazard exists, spark-resistant tools made of non-ferrous materials shall be used.
 - Electrical tools shall be identified as intrinsically safe.
- 4.2.17 If the task presents electrical hazards, worker must be competent and use the appropriate insulated tools to perform work that includes the risk of electrical shock. Cushioned grip handles do not protect against electrical shock.
- 4.2.18 The fluid used in hydraulic power tools must be an approved fire-resistant fluid and must retain its operating characteristics at the most extreme temperatures to which it will be exposed. The exception to fire-resistant fluid involves all hydraulic fluids used for the insulated sections of derrick trucks, aerial lifts, and hydraulic tools that are used on or around energized lines. This hydraulic fluid shall be of the insulating type.
- 4.2.19 All tools designed to accommodate guards must have the guard(s) in place when the tool is in use. Do not modify, remove, or disable any machine guards.
- 4.2.20 Do not allow loose clothing, long hair, loose jewelry, rings, and chains to be worn while working with power tools.
- 4.2.21 Make provisions to prevent tools from automatically restarting upon restoration of power. Refer to *S3AM-325-PR Lockout Tagout*.
- 4.3 Training
 - 4.3.1 Instruction in the proper use, safe handling, and maintenance of tools will be provided to employees unfamiliar with the tool.
 - Assess the employee's training needs as per *S3AM-003-PR1 SH&E Training* procedure.
 - Refer to the applicable work instructions associated with this procedure for any additional training specifics.
 - Training shall include applicable manufacturer's recommendations and guidelines.
 - 4.3.2 Employees shall demonstrate knowledge and competency in the use, safe handling and maintenance of the applicable tool prior to operation.
- 4.4 Personal Protective Equipment (PPE)
 - 4.4.1 Utilize basic PPE appropriate to the task; gloves, safety-toed boots, hard hats and safety glasses with side shields. Refer to *S3AM-208-PR1 Personal Protective Equipment*.
 - 4.4.2 Ensure lockout devices (padlocks, multiple lock hasps, tags) are utilized as necessary. Refer to *S3AM-325-PR Lockout Tagout*.

- 4.4.3 Ensure PPE is appropriate to the work and use additional PPE as required (e.g. mono-goggles, hearing protection, respiratory protection, etc.).
 - Dual eye protection is required to be worn by any employee undertaking or within 3 ½ feet (1 meter) of a task that produces projected particles or material.
 - Head and face protection is recommended for employees working with pneumatic tools.
 - Noise hazard is associated with pneumatic and many other tools. Working with noisy tools such as jackhammers requires proper, effective use of appropriate hearing protection.
- 4.4.4 Screens shall also be set up to protect nearby workers from being struck by flying fragments around chippers, riveting guns, staplers, or air drills.
- 4.4.5 Refer to the applicable work instructions associated with this procedure for any additional specialized PPE.
- 4.5 Inspections
 - 4.5.1 All tools must be inspected prior to each use.
 - Any tool that is defective or has missing parts must not be used.
 - Every broken or defective tool must be tagged 'out of service' or 'do not use' and immediately removed from service.
 - Tagged tools will be returned to the supervisor for repair or replacement.
 - 4.5.2 All tools must be inspected to manufacture's specifications and according to tool rests and guard adjustment tolerances. All tools will be inspected to ascertain that all safety devices are present and functioning properly. Refer to *S3AM-305-FM1 Hand & Power Tool Maintenance Inventory* and *S3AM-305-FM2 Hand & Power Tool Inspection Report*.

5.0 Records

- 5.1 None

6.0 Attachments

- 6.1 [S3AM-305-ATT1 Chainsaw](#)
- 6.2 [S3AM-305-ATT2 Circular Saw](#)
- 6.3 [S3AM-305-ATT3 Cut Off Saw](#)
- 6.4 [S3AM-305-ATT4 Handheld Grinder](#)
- 6.5 [S3AM-305-ATT5 Impact Wrench](#)
- 6.6 [S3AM-305-ATT6 Nail Gun](#)
- 6.7 [S3AM-305-ATT7 Dustless Vacuum](#)
- 6.8 [S3AM-305-ATT8 Power Drill](#)
- 6.9 [S3AM-305-ATT9 Pressure Washer](#)
- 6.10 [S3AM-305-ATT10 Reciprocating Saw](#)
- 6.11 [S3AM-305-ATT11 Sander](#)
- 6.12 [S3AM-305-ATT12 Knives](#)

- 6.13 [S3AM-305-ATT13 Clearing & Grubbing Equipment](#)
- 6.14 [S3AM-305-ATT14 Pneumatic Tools](#)
- 6.15 [S3AM-305-ATT15 Manual Hand Tools](#)
- 6.16 [S3AM-305-ATT16 Small Engines](#)
- 6.17 [S3AM-305-ATT17 Electric & Battery Hand Tools](#)
- 6.18 [S3AM-305-FM1 Hand & Power Tool Maintenance Inventory](#)
- 6.19 [S3AM-305-FM2 Hand & Power Tool Inspection Report](#)

Hazardous Waste Operations

S3AM-117-PR1

1.0 Purpose and Scope

- 1.1 Provides requirements for AECOM operations pertaining to hazardous waste and emergency response (HAZWOPER) services. In Canada and South America, there is no direct counterpart to HAZWOPER; however, as due diligence and in compliance with applicable duty of care/general duty clauses, staff working in Canada and South America will comply with this procedure as far as it aligns with the location's respective legislation.
- 1.2 Provides a procedure intended to address small incidental spills from work related equipment and supplies. For operations with bulk quantities of fuels, chemicals, oils, and for operations where AECOM is providing emergency response services for spills, the SH&E Manager or designee shall specify spill prevention and preparedness criteria including training, equipment, and proficiency.
- 1.3 To define appropriate procedures to decontaminate both equipment and personnel when exposure to hazardous chemicals or physical agents has occurred.
- 1.4 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

- 2.1 **Contamination Reduction Zone (CRZ)** – The transition area between the contaminated area and the clean area where decontamination activities occur.
- 2.2 **Decontamination** – The process of removing or neutralizing contaminants that have accumulated on personnel or equipment.
- 2.3 **Emergency Response** – A response effort by employees from outside the immediate release area or by other designated responders (e.g., mutual-aid groups, local fire departments, etc.) to an occurrence that results, or is likely to result, in an uncontrollable release of a hazardous substance or whenever a release requires that a federal, state, territorial or provincial agency be notified, such as:
 - A release at or above a reportable quantity (RQ) of a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substance (40 CFR 302.8) is required to be reported to the National Response Center (NRC).
 - A release at or above provincial reporting thresholds, if any, or alternatively those specified under the Canadian Transportation of Dangerous Goods Act are reportable under the Canadian Environmental Protection to the respective provincial or territorial Environmental Regulatory Agency .
 - A hazardous chemical release at or above an RQ under the Emergency Planning and Community Right-to-Know Act (EPCRA) (Title III under the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 350-372) is required to be reported to state and local officials.
 - A release in violation of a facilities Spill Prevention, Control, and Countermeasure (SPCC) Plan (40 CFR 112).

Responses to incidental release of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area or by maintenance personnel are not considered to be emergency responses within the scope of the HAZWOPER standard. Responses to releases of hazardous substances where there is no potential safety or health hazard are not considered to be emergency responses.
- 2.4 **Exclusion Zone (EZ)** – The area where contamination does or could occur.

- 2.5 **First Responder** – First responders are individuals who are likely to witness or discover a hazardous substance release, injury, fire, or other incident and who have been trained to initiate an emergency response sequence by notifying the proper authorities of the release. They would take no further action beyond first aid, initial control of the incident, and notifying the authorities and others of the incident.
- 2.6 **Hazardous Materials** – A hazardous material is any item or agent (biological, chemical, physical) that has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Additionally a hazardous material may be defined as any substance or chemical which is a "health hazard" or "physical hazard," including chemicals that are carcinogens, toxic agents, irritants, corrosives, sensitizers; agents that act on the hematopoietic system; agents that damage the lungs, skin, eyes, or mucous membranes; chemicals that are combustible, explosive, flammable, oxidizers, pyrophoric, unstable-reactive, or water-reactive; and chemicals that in the course of normal handling, use, or storage may produce or release dusts, gases, fumes, vapor, mists, or smoke that may have any of the previously mentioned characteristics. This may be caused when released by spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, disposing into the environment, by being transported or moved, and items or chemicals that are "special nuclear source" or by-product materials or radioactive substances.
- 2.7 **Hazardous Materials Specialist** – Hazardous materials specialists are individuals who respond with and provide support to hazardous materials technicians. Their duties parallel those of the hazardous materials technician; however, those duties require a more directed or specific knowledge of the various substances they may be called upon to contain. The hazardous materials specialist would also act as the site liaison with federal, state, local, and other government authorities in regards to site activities.
- 2.8 **Hazardous Materials Technician** – Hazardous materials technicians are individuals who respond to releases or potential releases for the purpose of stopping the release. They assume a more aggressive role than a first responder in that they will approach the point of release in order to plug, patch, or otherwise stop the release of a hazardous substance.
- 2.9 **Hazardous Waste** – Hazardous waste is waste that is dangerous or potentially harmful to our health or the environment. Hazardous wastes can be liquids, solids, gases, or sludge. They can be discarded commercial products, like cleaning fluids or pesticides, or the by-products of manufacturing processes. Hazardous waste are divided into:
- Listed wastes (<http://www.epa.gov/osw/hazard/wastetypes/listed.htm>);
 - Characteristic wastes (<http://www.epa.gov/osw/hazard/wastetypes/characteristic.htm>);
 - Universal wastes (<http://www.epa.gov/osw/hazard/wastetypes/universal/index.htm#wastes>); and
 - Mixed wastes;
 - Specific procedures determine how waste is identified (<http://www.epa.gov/osw/hazard/wastetypes/wasteid/index.htm>), classified, listed, and delisted.
- 2.10 **Health and Safety Plan (SH&E PLAN)** – A document prepared for each project that contains site-specific information including the Emergency Response Plan for the project.
- 2.11 **Incidental Releases** - A response to a spill or release of a hazardous substance (in quantities below its RQ) where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area using equipment and materials available to them at the time or the spill or release. Any spill or release that cannot be managed with the personnel, materials, and equipment at the site shall be considered an Emergency Response.
- Responses to releases of hazardous substances where there is no potential safety or health hazard (i.e., fire, explosion, or chemical exposure) are not considered to be emergency responses. Handling of incidental releases shall be in accordance with applicable standard operating procedures.

- 2.12 **Incident Command System (ICS)** – ICS is a standardized on-scene incident management concept designed specifically to allow responders to adopt an integrated organizational structure equal to the complexity and demands of any single incident or multiple incidents without being hindered by jurisdictional boundaries. In the ICS the first person responding to an incident becomes the Incident Commander and turns that title and duties over to more qualified responders as they arrive on scene.
- 2.13 **Incident Commander** – The Incident Commander (IC) is responsible for all aspects of the response, including developing incident objectives and managing all incident operations. The title and responsibilities are typically assumed by a qualified IC from the client or public sector.
- 2.14 **Support Zone (SZ)** – An uncontaminated zone where administrative and other support functions (e.g. first aid, equipment supply, emergency information, etc.) are located.

3.0 References

- 3.1 RS2-003-PR1 Disruptive Event Response Standard
- 3.2 S3AM-003-PR1 SH&E Training
- 3.3 S3AM-004-PR1 Incident Reporting, Notifications & Investigation
- 3.4 S3AM-010-PR1 Emergency Response Planning
- 3.5 S3AM-012-PR1 First Aid
- 3.6 S3AM-017-PR1 Injury & Illness Recordkeeping
- 3.7 S3AM-127-PR1 Exposure Monitoring
- 3.8 S3AM-128-PR1 Medical Screening & Surveillance
- 3.9 S3AM-208-PR1 Personal Protective Equipment
- 3.10 S3AM-209-PR1 Risk Assessment & Management
- 3.11 S3AM-213-PR1 Subcontractor Management

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Manager

- Enforces and supports the implementation of SH&E Plans, Location Specific Emergency Response Plans, and Spill Response Plans;
- Prepare or request a SH&E Plan for every AECOM project with Hazardous Waste Operations and Emergency Response Activities, refer to *S3AM-209-PR1 Risk Assessment & Management*;
- Verify that all personnel working on the project are qualified to perform the activities they are assigned (see HAZWOPER and Emergency Spill Response Training requirements below);
- Request client's emergency response procedures;
- Appoint a Site Safety Officer (SSO) with appropriate qualifications for the specific hazardous waste project;
- Confirm that the SSO for complex projects, such as those with complicated remediation activities, has no duties other than site safety and health of the field team;
- Confirm the communication of the location-specific emergency response plan details to all employees assigned to a field project;
- Authorize the procurement of the necessary decontamination supplies;

- Verify that the applicable decontamination steps are clearly defined in the approved SH&E Plan;
- Verify staff are appropriately trained to execute the defined decontamination procedures;
- Verify that adequate staffing is available to safely conduct the applicable decontamination steps;
- Confirm that the necessary communications equipment for the project is available;
- Confirm that incident investigations are performed as required and a report is filed. Refer to *S3AM-004-PR1 Incident Reporting, Notifications & Investigation*;
- During spill response, all AECOM emergency responders and their communications shall be coordinated and controlled through the Manager. The individual in charge shall implement the and shall be responsible for the following tasks:
 - Become the individual in charge at the incident until relieved by more qualified personnel;
 - Notify the appropriate agency, the AECOM incident Reporting line, and operations. Refer to *S3AM-117-ATT1 Spill Notification Numbers North America* for US and Canadian required notifications;
 - Designate a safety supervisor who is knowledgeable about the operations being implemented at the emergency response site and who will have specific responsibility to identify and evaluate hazards and to provide direction on the safety of operations for the emergency at hand. If the safety supervisor judges activities to be an Immediately Dangerous to Life or Health (IDLH) and/or to involve an imminent danger condition, the safety supervisor shall have the authority to alter, suspend, or terminate those activities. The safety official shall immediately inform the individual in charge of the ICS of any actions needed to be taken to correct these hazards at the emergency scene;
 - Identify all hazardous substances or conditions present and address as appropriate site analysis, use of engineering controls, maximum exposure limits, hazardous substance, and handling procedures;
 - Implement appropriate emergency operations. Refer to *S3AM-010-Emergency Response Planning*;
 - Limit the number of emergency response personnel at the emergency site;
 - Implement the buddy system in groups of two or more;
 - Confirm that the PPE worn is appropriate for the hazards to be encountered;
 - Implement appropriate decontamination procedures after emergency operations have terminated.
- Responsibility for the emergency response shall be transferred upon arrival of a more qualified AECOM Incident Commander or a Public Service Incident Commander.
- Confirm appropriate communications concerning an emergency event are initiated as per *S3AM-010-PR1 Emergency Response Planning* and *RS2-003-PR1 Disruptive Event Standard*.

4.1.2 SH&E Manager or designee

- Provide technical guidance for:
 - The development and implementation of SH&E Plans and Emergency Response Plans;
 - The Incident Commander regarding the correct way to respond to the spill;
 - Project-specific Spill Response Plans when required;
- Prepare emergency action plans as part of project SH&E Plans and emergency reference sheets;

- Interface with the local emergency responders when necessary;
- Interface with clients regarding facility emergency response procedures;
- Decide whether AECOM or an outside emergency response company will clean up the spill;
- Report spills, as necessary, to state/provincial environmental agencies;
- Review the incident report and facilitate the post-response discussion;
- Review and revise this procedure as necessary based on recommendations from post-response discussions;
- Advise Managers and Supervisors on the necessary decontamination procedures for the known or reasonably anticipated chemical hazards and physical agents associated with the planned scope of work;
- Support the project team to verify that adequate protective measures are in-place (e.g. Engineering Controls, Administrative Controls, Personal Protective Equipment, etc.).

4.1.3 **Site Safety Officer (SSO)**

- Verify that a SH&E PLAN is available for the project and is reviewed prior to the commencement of site activities;
- Conduct pre-entry briefing and daily tailgate meetings and review facility, site-specific emergency procedures, and site specific decontamination procedures;
- Communicate the site-specific emergency response details to all employees assigned to a field project;
- Establish the designated site work zones (e.g., EZ, CRZ, SZ, etc.);
- Enforce the applicable decontamination steps as defined in the approved SH&E Plan;
- Initiate Stop Work and emergency response procedures as required;
- Account for all AECOM and subcontractor employees after site evacuation;
- Brief on-site and off-site responders in the event of an emergency;
- Conduct site-specific training on the applicable decontamination steps/procedures;
- Procure the necessary decontamination supplies and establishing the decontamination line;

4.1.4 **Employees**

- Maintain HAZWOPER training, or equivalent training as it relates to the given jurisdiction;
- Follow the SH&E Plan and emergency procedures prepared for the project;
- Initiate Stop Work if necessary;
- Initiate emergency response via verbal communications or the alarm system if first to encounter an emergency;
- Follow the defined decontamination steps as stated in the approved SH&E Plan;
- Follow precautions and safe handling practices to avoid spills;
- Alert Manager to any deteriorating hazardous materials containers within the office or project area;
- Report all spills and leaks to the Manager immediately;
- Secure the spill area as quickly as possible and prevent the migration of exterior spilled materials or substances to drains or other openings; and

- 4.1.5 **All personnel** (e.g., AECOM employees, general laborers, equipment operators, chemists, supervisors, etc.) performing activities at hazardous waste sites that expose or potentially expose them to hazardous wastes and health hazards are considered HAZWOPER site workers and shall meet the training and medical surveillance requirements specified in 29 CFR 1910.120(e) and (f), respectively. Additional training may be required based on site activities including related exposures and risks (e.g., confined space entry, excavations, fall protection, other materials [lead], etc.). These additional training requirements are to be outlined in the project- or site-specific SH&E Plan.
- 4.2 Project SH&E Documentation—SH&E Plan
- 4.2.1 The project SH&E documentation prepared for HAZWOPER activities is referred to as a site-specific SH&E Plan, and shall meet the requirements presented in 29 CFR 1910.120(b)(4).
- 4.2.2 A safety and health risk or hazard analysis for each on-site task that will be performed.
- 4.2.3 The required SH&E Plan elements include:
- A description of the work location, the site history, and a summary of any information available concerning site hazards (including both physical hazards and contamination conditions);
 - A summary of the work activities to be performed under AECOM's scope of activities;
 - Identified risks shall include both chemical and physical hazards to which personnel may be exposed during the conduct of the work task;
 - Protective measures for each work task to prevent or mitigate the potential hazards identified in the hazard analyses;
 - Personal protective equipment (PPE) requirements for each work task. Refer to *S3AM-208-PR1 Personal Protective Equipment*;
 - Frequency and types of air monitoring, personal monitoring, and environmental sampling techniques and instrumentation to be used;
 - Site control measures;
 - Decontamination procedures;
 - An emergency response plan, *S3AM-010-PR1 Emergency Response Planning*, addressing actions to be taken in the event of each type of credible incident that might result during the performance of planned work activities, including minor and major injuries, and chemical release and fire. Response plans shall address the means for coordinating the evacuation of all on-site personnel in the event of a catastrophic incident.
- 4.2.4 Responsibility for development of each AECOM SH&E Plan will be coordinated between the Manager and the SH&E Manager or SH&E Department designee as part of project initiation. Regardless of where the SH&E Plan is developed, it will be reviewed and approved by the SH&E Manager prior to submission to any agency outside of AECOM.
- 4.2.5 Contractors and Subcontractors
- The health and safety of the employees of any contractor or subcontractor who does not have a contract directly with AECOM, and for whom AECOM does not have contractual safety oversight, is the responsibility of that contractor or subcontractor. The contractor or subcontractor shall evaluate the hazards and potential hazards to their own employees and shall adhere to their own Health and Safety Plan;
 - Subcontractors who maintain a contract directly with AECOM shall comply with AECOM SH&E program requirements. Refer to *S3AM-213-PR1 Subcontractor Management*;
 - In addition, all AECOM subcontractors' Health and Safety Plans shall, at a minimum conform to the requirements of the AECOM SH&E Plan. The AECOM SH&E Plan does not, nor is it intended to, address procedures of contractors or subcontractors during their site activities.

4.3 Personnel Qualifications— Training and Medical Surveillance

4.3.1 HAZWOPER-qualified employees shall participate in the following medical surveillance and training requirements. Medical surveillance and SH&E training requirements are further described in *S3AM-128-PR1 Medical Screening & Surveillance* and *S3AM-003-PR1 SH&E Training* respectively.

4.3.2 Employees receiving initial and refresher responder training shall be issued a certificate indicating training competency. Copies of all training records shall be maintained in accordance with the *S3AM-003-PR1 SH&E Training*.

4.3.3 Medical Surveillance

- Specific HAZWOPER medical examination protocols have been developed by AECOM's Corporate Medical Provider (CMP) to meet the requirements of 29 CFR 1910.120(f). To be medically qualified to perform HAZWOPER work, employees receive the following medical examinations:
 - Initial (Baseline) Examination — The initial examination is part of pre-employment requirements and shall be completed (with results received) prior to the employee's start of work date;
 - Annual Examination — HAZWOPER-qualified employees will complete a medical examination once each year. Medical qualification expires on the anniversary date of the last examination completed. There will be no "grace period" exemptions beyond this date without the express approval of the Region SH&E Manager. At the recommendation of the SH&E Department, the CMP may approve an alternate examination frequency at periods of up to two years (biennial) in cases in which the worker's exposures to environmental contaminants are infrequent and typically well below any occupational exposure limits (e.g., senior management personnel);
 - Termination Examination — When reassigned to non-HAZWOPER duties or at the conclusion of employment at AECOM, HAZWOPER-qualified personnel will be provided with the opportunity to receive a termination medical examination;
 - Special Examinations — The SH&E Department and the CMP will jointly determine the need for special examinations because of:
 - Unusual exposure conditions; and
 - In response to possible overexposures.
- The CMP will determine the medical protocol elements for each of these examinations based on exposure information provided by the SH&E Department. The CMP will evaluate the results of each Employee's examination and will provide a written statement of medical clearance clearly stating medical compliance with the HAZWOPER regulatory standard (29 CFR 1910.120(f)) and approval of the Employee to perform unrestricted HAZWOPER activities. For initial and annual examinations, the CMP will also evaluate the Employee for the use of air purifying and supplied air respiratory protection. The written evaluation from these examinations will indicate the CMP's approval/limitations on the Employee's use of respiratory protection;
- If an Employee does not wish to participate in part or in the complete medical surveillance program, and is permitted by the given jurisdiction, the employee shall provide a written statement of refusal. Refer to *S3AM-128-PR1 Medical Screening & Surveillance*;

4.3.4 Training - HAZWOPER

All personnel assigned to work at a hazardous waste site, sampling at Treatment, Storage and/or Disposal Facilities (TSDFs), or are performing Remediation and Investigation Activities, shall participate in training meeting the requirements of 29 CFR 1910.120(e), or equivalent training as it relates to the given jurisdiction. All personnel shall have the following training:

- 40-hour initial Training — Before being assigned to a HAZWOPER site, AECOM Employees shall complete 40 hours of off-site training meeting the requirements of 29 CFR 1910.120(e)(3)(i). At the conclusion of training, personnel will receive a written certification of course completion, signed by the instructor, that indicates the course of instruction (40-hour HAZWOPER) and training dates. A copy of this certification shall be provided to the employee's SH&E Manager. Employees are responsible for maintaining their own copy of this certificate and for presenting it to the SSO when working on any HAZWOPER site;
- 3 days of on-the-job training — The Employee shall receive 3 days of actual supervision by a trained experienced supervisor;
- Refresher 8-Hour Training — To remain qualified to perform on-site HAZWOPER work activities, each AECOM Employee will complete 8 hours of HAZWOPER refresher training meeting the requirements of 29 CFR 1910.120(e)(8) at yearly intervals following completion of Initial 40-hour training. At the conclusion of training, personnel will receive a written certification of course completion, signed by the instructor, that indicates the course of instruction (8-hour HAZWOPER Refresher) and the training date. A copy of this certification shall be provided to the employee's SH&E Manager. Employees are responsible for maintaining their own copy of this certificate and for presenting it to the SSO when working on any HAZWOPER site;
- 8-hour Supervisor 8-Hour Training - any AECOM Employee acting in a management capacity for HAZWOPER activities (e.g., project manager, site safety officers, etc.) shall complete an additional 8 hours of HAZWOPER Supervisor training meeting the requirements of 29 CFR 1910.120(e)(4). Although this training is required only once, supervisors shall maintain their overall HAZWOPER qualification through annual completion of refresher training. At the conclusion of Supervisor 8-Hour Training personnel will receive a written certification of course completion, signed by the instructor that indicates the course of instruction and the training date. A copy of this certification shall be provided to the SH&E Manager. Employees are responsible for maintaining their own copy of this certificate and for presenting it to the SSO when working on any HAZWOPER site;
- 24-Hour HAZWOPER Training — Site support contractors and site visitors may qualify to substitute 24-hour HAZWOPER training in place of 40-hour training, as specified in 29 CFR 1910.120(e)(3)(ii). Personnel potentially qualifying for this alternative training include:
 - Site support personnel who will not work in any Exclusion Zone areas;
 - Subcontractors and site visitors whose duties will not entail significant exposure to site contaminants defined as not working in any areas where airborne contaminant concentrations exceed one-half of any applicable occupational exposure limit, and no contact or exposure to materials with site contaminant concentrations exceeding natural background levels. The SH&E Manager shall approve the substitution of 24-hour training for initial 40-hour training. Persons qualifying for 24-hour training shall provide written certification of course completion prior to beginning work on site. Persons completing 24-hour training shall complete 8 hours of annual refresher training at the required interval to maintain eligibility for on-site work and shall provide proof of this training (as necessary to demonstrate retraining) prior to beginning work on site.

Available Training Sources:

- On-site training provided by the SH&E Department;
- Outsourced training providers approved by the SH&E Department;

4.3.5 Training – Emergency Response

On an as-needed basis, if a project requires AECOM to provide a HAZMAT emergency response team, the following training requirements shall be met:

- Operations Level – a minimum of 8 hours of initial and refresher training for those responsible for acting defensively in the case of a release, attempting to contain the release from a safe distance;
- HAZMAT Technician – at least 24 hours of initial training and 8 hours of refresher training. They will participate in operations-level training and know how to implement the emergency response plan for the facility/site/project location;
- HAZMAT Specialist – at least 24 hours of initial training and 8 hours of refresher training. They will be trained in the same content as the HAZMAT Technician, as well as in how to develop a site safety and control plan;
- Incident Commander – will have at least 40 hours of training covering the Operations Level training and techniques for implementing the emergency response plan and directing the incident. They will be knowledgeable in relevant regulations. The Incident Commander will become the individual in charge of a site-specific incident command system and will coordinate and control communications with external agencies;

4.3.6 Subcontractor Personnel Training Records

Any subcontractor organization whose employees will support AECOM operations at a HAZWOPER site will:

- Provide the Manager with a copy of their written HAZWOPER medical surveillance and training program requirements. The elements of the program(s) shall be similar to those for AECOM's own program, as detailed above. Refer to *S3AM-213-PR1 Subcontractor Management*;
- Provide the Manager with written certification of a physician's approved medical clearance for each employee who will work on the site. Certification can be demonstrated by:
 - A copy of the physician's signed medical clearance for each employee (preferred); or
 - A letter identifying the medical status and clearance expiration date of every employee, signed by the company's safety director or an officer of the company.
 - A copy of the each employee's training certifications, which will include:
 - The initial 40-hour training certificate (24-hour training may be substituted with SH&E Manager approval);
 - The most current Refresher training certificate (shall be current within the previous one-year period);
 - A copy of the Supervisor training certificate for each person serving in a site supervisory capacity (e.g., project manager, site safety officers, etc.).

4.4 HAZWOPER and Spill Response Equipment

4.4.1 Specific HAZWOPER activity and spill response equipment shall be identified in the site specific SH&E PLAN. All AECOM offices and project sites that store chemicals at their location shall have the appropriate spill response equipment. Such equipment may include the following:

- Over-pack containers of varying capacities;
- Absorbent material such as vermiculite or commercially prepared, absorbent containing pillows, rolls, sheets, or booms;
- Acid and base neutralizing agents;
- Chemically resistant gloves for solvents, alcohols, and acids;
- Poly-coated Tyvek coveralls;
- Safety goggles;
- Respiratory protection;

4.4.2 Spill response equipment shall be placed adjacent to areas where chemicals are routinely handled, stored, and/or where shipments are received. Similar types of spill response equipment shall also be available in any AECOM vehicle or rented vehicle in which chemicals are being transported. Location of spill response equipment shall be selected to permit access outside of likely spill locations.

4.4.3 Spill Response Equipment for Field Programs

- The amount of chemicals being used during a field program will dictate the types and quantity of spill response equipment that is brought to the site;
- If several squirt bottles of decontamination solution are all that is being brought to a site, a few spill pillows and a one-gallon bucket (3.8 liters) may be sufficient to respond to a spill of these materials;
- If gallons of chemicals are being delivered to the site in drums or bulk tanks, a greater variety of spill response equipment will be needed. As indicated previously, during these types of field programs, a separate spill plan will be incorporated into the project or site specific SH&E Plan, and will provide a greater level of detail regarding the specific spill response effort for that field program. Refer to *S3AM-209-PR1 Risk Assessment & Management*,

4.5 Personal Protective Equipment (PPE) Ensembles

4.5.1 Defined HAZWOPER PPE ensembles are specified for general use on all AECOM HAZWOPER operations. The project SH&E Plan may specify modifications to these requirements to meet site-specific conditions. Refer also to *S3AM-208-PR1 Personal Protective Equipment* for additional information concerning PPE requirements.

4.5.2 Level D Ensemble

The Level D ensemble provides a minimal level of skin protection (primarily against physical rather than chemical hazards) and no respiratory protection. Level D PPE is the minimum work uniform to be used on HAZWOPER sites. Its use is appropriate when there is no significant potential for encountering hazardous substances or health hazards while working in controlled work areas.

Level D Equipment List:

- Hard hat;
- Eye protection;
- Safety-toe work boots;
- Shirts with sleeves and long pants (shorts are unacceptable for use); and
- Hearing protection (as required).

4.5.3 Modified Level D Ensemble

The Modified Level D ensemble provides moderate skin protection against contact with hazardous substances, but no respiratory protection. Its use is appropriate where there is a moderate-to-low potential for skin contact with known hazardous substances and health hazards, but no significant inhalation hazard is anticipated. The Modified Level D ensemble will consist of the Level D ensemble, supplemented by the addition of one or more of the following items:

Modified Level D Equipment List:

- Full faceshield;
- Plain (uncoated) disposable coveralls;
- Chemical-resistant disposable outer coveralls;

- Chemical-resistant outer gloves taped to outer coveralls;¹
- Chemical-resistant inner gloves; and¹
- Chemical-resistant safety-toe boots (taped to outer coveralls).

4.5.4 Level C Ensemble

The Level C ensemble provides moderate skin protection against contact with hazardous substances and moderate respiratory protection. Its use is appropriate where there is the potential for skin contact with known hazardous substances and health hazards, together with a limited and well-defined potential for exposure via inhalation.

Level C Equipment List:

- Full-face air-purifying respirator (APR) equipped with cartridge types as designated in the project SH&E PLAN;²
- Plain (uncoated) disposable coveralls;
- Chemical-resistant disposable outer coveralls;
- Chemical-resistant outer gloves taped to outer coveralls;³
- Chemical-resistant inner gloves;
- Hard hat;
- Safety-toe boots taped to coveralls; the use of boot covers (e.g., booties) or chemical-resistant boots may be specified; and
- Hearing protection (as required).

4.5.5 Level B Ensemble

The Level B ensemble provides both the highest level of inhalation exposure protection and considerable skin contact protection. Its use is appropriate where there are significant known or suspected hazardous substances and health hazards, involving both skin and inhalation exposure (up to and including Immediately Dangerous to Life or Health [IDLH] conditions) or where adverse atmospheric conditions cannot be mitigated by use of air purifying respirators (e.g. oxygen deficient atmospheres or chemicals with poor warning properties). The use of Level B PPE requires prior approval by the SH&E Manager.

Level B Equipment List:

- Supplied air respirator (SCBA or airline system with Grade D or better breathing air);
- Chemical-resistant disposable outer coveralls;
- Chemical-resistant outer glove taped to outer coveralls;³
- Chemical-resistant inner gloves;³
- Hard hat;
- Chemical resistant safety-toe boots taped to coveralls; and
- Hearing protection (as required).

¹ Selection of specific glove types/materials will be provided in the project SH&E Plan based on consideration of the contaminants and the physical conditions of the work.

² Selection of specific cartridges will be made by the SH&E Department (or Competent Person – Respiratory Protection as designated by the SH&E manager) based on contaminants present. A cartridge change-out frequency will also be specified in the SH&E based on the manufacturer's cartridge performance data.

³ Selection of specific glove types/materials will be provided in the project SH&E based on consideration of the contaminants and the physical conditions of the work.

4.5.6 Level A Ensemble

The Level A ensemble provides the highest level of both respiratory and skin protection, up to and including protection against skin contact with vapor-phase contaminants. The use of Level A PPE requires prior approval by the Americas SH&E Director.

Specific Level A ensemble components will be determined on a case-by-case basis by the SH&E Department.

4.6 Emergency Response Plans

- 4.6.1 A Location Specific Emergency Response Plan shall be developed and implemented to handle anticipated emergencies prior to performing emergency response operations. The plan shall be in writing and available for inspection and copying by employees, their representatives, and OSHA personnel. The plan shall be reviewed and approved by the SH&E Manager prior to issue.
- 4.6.2 AECOM'S *S3AM-010-PR1 Emergency Response Planning* shall apply and employees shall evacuate from the danger area whenever an emergency occurs, provided the associated contract does not require AECOM to provide emergency response services
- 4.6.3 AECOM Employees are not expected to take action or to participate in rescues or responses to chemical releases beyond the initial discovery of the release and immediate mitigation actions such as closing a valve, placing absorbents, and notifying the client and or public emergency response system (911).
 - If AECOM Employees are to participate in the response to a chemical release beyond the initial reaction, there shall be a contractual provision for this response and the Employees shall be specifically trained for this response;
 - This document is designed to provide guidelines on how to prepare a written plan that will confirm prompt and proper response to an emergency situation that arises during field investigations and to outline the duties of AECOM Employees during a field emergency and the associated training requirements.
- 4.6.4 Site specific SH&E plans that are prepared to comply with the HAZWOPER standard (29 CFR 1910.120) shall address emergency response. This standard specifically outlines the elements that shall be contained in an emergency response plan. However, the definition of emergency response, as written in 29 CFR 1910.120, focuses on emergencies involving the uncontrolled release of hazardous substances. Under 29 CFR 1910.120, an employer can opt to evacuate employees from the danger area when such an emergency occurs. AECOM does not expect its Employees to actively assist in the handling of uncontrollable chemical releases that may occur during the implementation of field programs. As such, and as provided by the HAZWOPER standard, AECOM is exempt from the emergency response plan requirements of the standard as long as it provides an emergency action plan within the SH&E PLAN that complies with 29 CFR 1910.38 (a). Therefore, all emergency response plans required under 29 CFR 1910.120 will be written to comply with 29 CFR 1910.38 (a).
 - There are two types of emergency situations that AECOM personnel shall be prepared for and that shall be addressed in the emergency response plan. These include:
 - Emergencies related to the operations of our clients at the facility where AECOM is working;
 - Emergencies related to our own on-site activities/investigations.
 - Employees are not to accept the role of Incident Commander without specific authority from the SH&E Manager and the Manager responsible for the project. Assuming the role of the Incident Commander requires training beyond the scope of this Procedure.

4.6.5 The HAZWOPER standard does not prohibit AECOM Employees from performing limited response activities.

- Appropriately trained AECOM Employees can provide voluntary First Aid services;
- AECOM Employees can provide response assistance by placing absorbent pillows or vermiculite around a small, contained spill that occurs during sampling efforts;
- Refer to Spill Response, Incidental procedures contained herein which describes the specific procedures that AECOM will follow when responding to an incidental chemical spill.

4.6.6 Field Project Preparation

- Every SH&E Plan that is prepared by AECOM will contain a Location Specific Emergency Response Plan in which the required elements of an emergency action plan will be addressed. Refer to *S3AM-010-PR1 Emergency Response Planning*;
- When AECOM is working at an operating facility, the emergency response procedures of the facility will be appended to the SH&E Plan or the Location Specific Emergency Response Plan;
- As a minimum, each emergency response plan shall contain the following topics as required by 29 CFR 1910.38 (a):
 - Procedures and contact information for reporting emergencies to public service responders and on-site (client or host employer) emergency control centers;
 - Pre-emergency planning and coordination with outside parties;
 - Emergency escape procedures and emergency escape route assignments;
 - Procedures to be followed by employees who remain to operate critical site operations before they evacuate;
 - Procedures to account for all employees after emergency evacuation is complete;
 - Rescue and medical duties for those employees who are trained to perform them;
 - Preferred means of reporting fires and other emergencies;
 - PPE to protect employees from expected exposures and potential exposures during an emergency;
 - Names of persons or departments who can be contacted for further information (i.e. emergency reference sheet);
 - Site security and control;
 - Availability of medical surveillance for workers who might have been exposed to chemicals, bloodborne pathogens, or other biological agents as a result of project work or emergency response;
 - Emergency medical treatment and first aid;
 - Emergency alerting and response procedures;
 - Critique of response and follow-up.
- In addition, each plan shall establish the specific alarm system that will be used on site to warn employees of an AECOM emergency. The chosen alarm signals should not conflict with alarm signals already in place at the facility.

4.6.7 Client Facility Emergency Response Procedures

- AECOM implements field programs on active properties, including manufacturing facilities. These facilities have typically developed an emergency response plan that is specific to facility-related emergencies. If AECOM is working at an operating facility, emergency procedures established by the facility shall be followed in the event of a facility catastrophe.

AECOM personnel shall be aware of and familiar with the alarm signals used at the facility to alert personnel to an emergency. AECOM personnel shall also know where to assemble in the event of a facility evacuation as the facility shall be able to account for all personnel, including subcontractors such as AECOM in the event of an evacuation.

- The first priority in AECOM's preparation of a project emergency action plan is to confirm that the responsibilities under the client's emergency response plan are fully understood. Because of the nature of their business, many of our clients have in-house fire brigades, medical staff, and hazardous materials teams that can assist AECOM in the event of an emergency related to our field activities. In many instances, our clients prefer or require that subcontractors seek emergency assistance through their facility first before calling outside responders to the site.
- A copy of the facility's procedures shall be made available to AECOM so that the information can be incorporated into the SH&E Plan or attached to the Location Specific Emergency Response Plan. If this information is not available to AECOM prior to arriving on site, the SSO shall meet with client representatives upon arrival to the facility to review procedures in the event of an emergency related to plant operations.

4.6.8 Escape Routes and Procedures

Although emergency evacuation procedures are included in AECOM's initial 40-hour HAZWOPER training, emergency procedures at each site will be different. Employees shall be instructed about the location specific emergency response plan. Updating training is required anytime escape routes or procedures change. An evacuation drill will be conducted for projects that are scheduled for one month or longer. Visitors and untrained employees shall not be allowed into the project area until they receive a safety briefing including evacuation alarms and procedures.

Prior to the commencement of on-site activities, the SSO shall determine how AECOM employees will evacuate each AECOM work area of the site:

- Two or more routes that are separate or remote from each other for each work area shall be identified. Multiple routes are necessary in case one is blocked by fire or chemical spill. These routes shall not overlap because, if a common point were obstructed, all intersecting routes would be blocked;
- Prominent wind direction should also be considered when designating escape routes and assembly areas. Escape routes and assembly areas should be upwind of the site whenever possible;
- Upon arrival to the site, the SSO shall verify that the selected routes are appropriate for evacuation. During an emergency, the quickest and most direct route should be selected. However, when working at an operating facility, the established escape routes of the facility should be used whenever possible;
- In the event of a facility-related emergency, all AECOM employees shall meet at the facility's assembly area so that the client can verify that AECOM has evacuated the property.

4.6.9 Alarm Signals

An emergency communication system shall be in effect at all sites.

- The most simple and effective emergency communication system in many situations will be direct verbal communications. However, verbal communications shall be supplemented any time voices cannot be clearly perceived above ambient noise levels and any time a clear line of sight cannot be easily maintained among all AECOM personnel because of distance, terrain, or other obstructions;
- Portable two-way radio communications may be used when employees shall work out of the line of sight of other workers;
- When it is necessary to supplement verbal communications, Employees shall be informed of the established emergency signals. The following emergency signals, or other appropriate signals, shall be implemented using handheld portable air horns, whistles, or similar devices.

Signals shall be capable of being perceived above ambient noise by all employees in the affected portions of the workplace:

- One Blast: General Warning—A relatively minor and localized, yet important, on-site event. An example of this type of an event would be a minor chemical spill where there is no immediate danger to life or health yet personnel working on the site should be aware of the situation so that unnecessary problems can be avoided. If one horn blast is sounded, personnel shall stop all activity and equipment on-site and await further instructions from the SSO;
- Three Blasts: Medical Emergency—A medical emergency for which immediate first aid or emergency medical care is required. If three horn blasts are sounded, all First Aid Providers should respond as appropriate. All other activity and equipment should stop and personnel should await further instructions from the SSO;
- Three Blasts Followed by One Continuous Blast: Immediate Threat to Life and Health — A situation that could present an immediate danger to life and health of personnel onsite. Examples include fires, explosions, large hazardous chemical release, severe weather-related emergencies, or security threats. If three horn blasts followed by a continuous blast are sounded, all activity and equipment shall stop. All personnel shall evacuate the site and meet in the designated assembly area where the SSO will account for all employees. The SSO will arrange for other emergency response actions if necessary. Information concerning the need to follow decontamination procedures during an emergency evacuation will be addressed in the Location Specific Emergency Response Plan;
- The SSO or his designate will acknowledge the distress signal with two short blasts on the air-horn or whistle;
- One Continuous Blast Following Any of the Above: All Clear/Return to Work — Personnel who sound the initial alarm are required to send an all clear signal when the emergency is over.

4.6.10 Accounting Method for All Employees after Evacuation

The SSO is responsible for determining that all AECOM employees have been successfully evacuated from the work area(s):

- It is the responsibility of each AECOM subcontractor to verify that all of its employees evacuated the site and to report this information to the SSO. All employees shall meet at the designated assembly area;
- A headcount is an acceptable way to determine complete evacuation when the field team is of a small size. The site log-in book or equivalent should be referenced when attempting to account for more than 10 people. In the event of a facility-related emergency, the SSO shall notify facility representatives that all AECOM employees and AECOM subcontract employees have successfully evacuated the work area(s);
- The SSO shall notify emergency responders if any employee is unaccounted for and where on the site they were last seen;
- In the event of a project-related emergency, the SSO will provide off-site emergency responders or on-site HAZMAT teams or fire brigades (Incident Commander) with all available knowledge about the emergency situation upon their arrival to the scene.

4.6.11 Employees Who Remain to Operate Critical Site Operations Before They Evacuate

All equipment and operations are required to cease in accordance with the established alarm signal procedures. The only exception will be related to health and safety:

- The SSO shall determine at the time of the emergency if health and safety will be jeopardized by immediate stoppage of any particular piece of equipment;

- If such a determination is made, personnel involved in critical operations shall be minimized. Once it is determined that the operation is no longer needed or the threat to the operators is imminent, operations will cease and the operators will immediately evacuate.

4.6.12 Rescue and Medical Response

- Only currently trained individuals will administer first aid, CPR or an AED. Refer to *S3AM-012-PR1 First Aid*.
- In the event of an incident, refer to material's SDS labels to confirm proper first aid is administered for the hazardous material and call the nearest Poison Centre or 911. Refer to *S3AM-012-PR1 First Aid*.
 - The American National Standards Institute (ANSI) Standard for Emergency Eyewash and Shower Equipment (ANSI Z358.1-1998) recommends that the affected body part shall be flushed immediately and thoroughly for at least 15 minutes using a large supply of clean fluid under low pressure. However, other references recommend a minimum 20-minute flushing period if the nature of the contaminant is not known. The flushing or rinsing time can be modified if the identity and properties of the chemical are known. For example, at least:
 - 5 minutes flushing time for mild irritants;
 - 20 minutes for moderate to severe irritants;
 - 20 minutes for non-penetrating corrosives;
 - 60 minutes for penetrating corrosives;
 - If irritation persists, repeat the flushing procedure.
- It is important to note that ingestion of any chemical is not likely to occur in the workplace. If ingestion does occur, evidence indicates that inducing vomiting is not necessary in most situations where there has been an occupational chemical ingestion.
 - Induction of vomiting should only be recommended if the chemical has very high, short-term (acute) toxicity, and medical follow-up is not readily available;
 - In these cases, first aiders should receive special training on how to safely and effectively induce vomiting in the appropriate circumstances.
- If the injury is life threatening, the Emergency Medical System (EMS) should be called (911). Depending on the procedures established for the project, the SSO would contact an emergency responder directly or notify the facility representatives for medical assistance;
- If the employee needs medical attention that cannot be provided on-site, the SSO shall escort the individual to the local hospital identified on the emergency reference sheet and shall remain with the person until release or admittance is determined. The escort will relay all appropriate medical information to the Manager and SH&E Manager.

4.6.13 On-site and Off-site Communications

Regardless of the size or location of AECOM's field projects, it is extremely important that both on-site and off-site communications be maintained so that in the event of an emergency employees can contact each other or place a phone call immediately with the appropriate responder(s).

A reliable and approved form of communication (e.g. two way radio, cell phone, etc.) is required when members of the field team are working in separate areas of the site and verbal communications are no longer effective because of distance. A communication device shall be available for each team that is working in a separate area of the site.

When AECOM is working at an occupied facility, a telephone may be accessible. When AECOM is working on abandoned properties or when there is no access to a phone, as appropriate, a cellular telephone, two-way radio, or satellite telephone shall be brought to the work location.

4.6.14 Preferred Means of Reporting

Employees shall immediately notify the Supervisor of incidents and emergencies, and report in accordance with *S3AM-004-PR1 Incident Reporting, Notification & Investigation*:

- Unless facility representatives specifically indicate that they prefer AECOM personnel to notify them first of an emergency, the SSO will directly contact the appropriate emergency responders listed on the Location Specific Emergency Response Plan;
- Additional communications within AECOM concerning an emergency event may be required as per *S3AM-010-PR1 Emergency Response Planning* and *RS2-003-PR1 Disruptive Event Standard*;
- "Dangerous occurrences" shall be reported immediately to the police, employer, vehicle owner/lesser and the dangerous goods owner. Such events would include spills, bulk container damage, fire, explosion, and transportation accidents involving dangerous goods;
- Confirm and seek direction on external reporting requirements. Each jurisdiction has regulations governing the minimum quantities for reporting based on the type of product spilled or release refer to *S3AM-117-ATT1 Spill Notification Numbers for North America*;

Individuals who have knowledge of a spill, release, or unlawful discharge, shall notify authorities immediately. Reporting does not imply guilt or assign blame. The following details are to be reported:

- Location and time of spill;
- Description of circumstances leading to spill;
- Type and quantity of material or substance spilled;
- Details of any action taken at the site of the spill;
- Description of location of spill and immediately surrounding the area;
- Any additional information in respect of the spill that the Minister, Environmental Protection Officer or person designated by regulations requires.

4.6.15 First Responder

First responders shall have sufficient training or have had sufficient experience to objectively demonstrate competency in the following areas:

- An understanding of what hazardous substances are, and the risks associated with them in an incident;
- An understanding of the potential outcomes associated with an emergency;
- The ability to recognize the presence of hazardous substances and physical hazards in an emergency;
- An understanding of the role of the first responder;
- The ability to realize the need for additional resources and to make appropriate notifications to the communication center.

4.6.16 First Responder HAZWOPER Operations Level

First responders at the operations level are individuals who respond to releases or potential releases of hazardous substances as part of the initial response to the site for the purpose of protecting nearby persons, property, or the environment from the effects of the release:

- They are trained to respond in a defensive fashion without actually trying to stop the release; Their function is to contain the release from a safe distance, keep it from spreading, and prevent exposures;

- First responders at the operational level shall have received at least eight hours of training or have had sufficient experience to objectively demonstrate competency in the following areas in addition to those listed for the awareness level and the employer shall so certify:
 - Knowledge of the basic hazard and risk assessment techniques;
 - Know how to select and use proper personal protective equipment provided to the first responder operational level;
 - An understanding of basic hazardous materials terms;
 - Know how to perform basic control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available with their unit;
 - Know how to implement basic decontamination procedures;
 - An understanding of the relevant standard operating procedures and termination procedures;

4.6.17 Hazardous Materials Technician

Hazardous materials technicians shall have received at least 24 hours of training equal to the first responder operations level and in addition have competency in the following areas and the employer shall so certify:

- Know how to implement the employer's emergency response plan;
- Know the classification, identification, and verification of known and unknown materials by using field survey instruments and equipment;
- Be able to function within an assigned role in the Incident Command System, refer to *Federal Emergency Management Agency—FEMA: Incident Command System*;
- Know how to select and use proper specialized chemical PPE provided to the hazardous materials technician;
- Understand hazard and risk assessment techniques;
- Be able to perform advance control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available with the unit;
- Understand and implement decontamination procedures;
- Understand termination procedures;
- Understand basic chemical and toxicological terminology and behavior.

4.6.18 Hazardous Materials Specialist

Hazardous materials specialists shall have received at least 24 hours of training equal to the technician level and in addition have competency in the following areas and the employer shall so certify:

- Know how to implement the local emergency response plan;
- Understand classification, identification, and verification of known and unknown materials by using advanced survey instruments and equipment;
- Know the state or applicable jurisdictional emergency response plan;
- Be able to select and use proper specialized chemical PPE provided to the hazardous materials specialist;
- Understand in-depth hazard and risk techniques;
- Be able to perform specialized control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available;

- Be able to determine and implement decontamination procedures;
- Have the ability to develop a site safety and control plan;
- Understand chemical, radiological, and toxicological terminology and behavior.

4.7 Decontamination Procedures

- 4.7.1 When possible, all necessary steps shall be taken to reduce or minimize contact with chemicals and impacted materials while performing field activities (e.g., avoid sitting or leaning on, walking through, dragging equipment over, tracking, or splashing potential or known impacted materials).
- 4.7.2 All personal decontamination activities shall be performed with an attendant (buddy) to provide assistance to personnel that are performing decontamination activities. An attendant may not be required for Level D equipment removal and decontamination. Depending on specific site hazards, attendants may be required to wear a level of protection that is equal to the required level in the exclusion zone.
- 4.7.3 All persons and equipment entering the EZ shall be considered contaminated, and thus, shall be properly decontaminated prior to entering the SZ. No equipment, including personal protective equipment or contaminated clothing shall be taken or worn into the SZ.
- 4.7.4 Decontamination procedures may vary based on site conditions and nature of the contaminant. If chemicals or decontamination solutions are used, care should be taken to minimize reactions between the solutions and contaminated materials. In addition, personnel shall assess the potential exposures created by the decontamination chemical(s) or solutions. The safety data sheets shall be reviewed, implemented, and filed by personnel contacting the chemicals/solutions.
- 4.7.5 All contaminated personal protective equipment (PPE) and decontamination materials shall be stored and disposed of in accordance with site-specific requirements identified in the approved work plan.
- 4.7.6 For all Level A and B ensembles, adequate supplied air shall be available to allow the employee to safely complete all necessary decontamination steps.
- 4.7.7 Where decontamination procedures involving radioactive materials are required, the removable limits for both personnel and equipment will be specified by a Certified Health Physicist or Certified Industrial Hygienist in the project's approved Radiation Protection Plan or approved safety planning document.
- 4.7.8 Materials Needed to Decontaminate Personnel and/or Equipment
- The equipment required to perform decontamination may vary based on site-specific conditions and nature of the contaminant(s). The following equipment is commonly used for decontamination purposes:
 - Soft-bristle scrub brushes or long-handled brushes to remove contaminants;
 - Hoses, buckets of water or garden sprayers for rinsing;
 - Large plastic/galvanized wash tubs or children's wading pools for washing and rinsing solutions;
 - Large plastic garbage cans or similar containers lined with plastic bags for the storage of contaminated clothing and equipment;
 - Metal or plastic cans or drums for the temporary storage of contaminated liquids;
 - Paper or cloth towels for drying protective clothing and equipment; and
 - Poly or plastic sheeting to lay down and form the base for the CRZ, as well as to contain contaminants and decontamination fluids.

4.7.9 Personal Decontamination Steps

- The decontamination plan shall be in writing and shall specify the exact steps in either wet or dry decontamination or personnel exiting the EZ to the SZ. The decontamination plan shall also address respirator cartridge change out, SCBA bottle changes and equipment decontamination.

4.7.10 Decontamination Steps during a Medical Emergency

- If decontamination can be done:
 - Wash, rinse and/or cut off protective clothing and equipment.
- If decontamination cannot be done:
 - Wrap the victim in blankets, plastic sheeting, or rubber to reduce contamination of other personnel;
 - Alert emergency and offsite medical personnel to potential contamination;
 - Instruct them about specific decontamination procedures if necessary;

4.7.11 Equipment Decontamination Steps

- All equipment leaving the EZ shall be considered contaminated and shall be properly decontaminated to minimize the potential for exposure and off-site migration of impacted materials. Such equipment may include, but is not limited to: sampling tools, heavy equipment, vehicles, PPE (hoses, cylinders, etc.), and various handheld tools;
- All Employees performing equipment decontamination shall wear the appropriate PPE to protect against exposure to contaminated materials. The level of PPE may be equivalent to the level of protection required in the EZ. Other PPE may include splash protection, such as face-shields and splash suits, and knee protectors. Following equipment decontamination, Employees may be required to follow the proper personal decontamination procedures above;
- For larger equipment, a high-pressure washer may need to be used. Some contaminants require the use of a detergent or chemical solution and scrub brushes to confirm proper decontamination. Personnel operating a high pressure washer will be trained in the operation of the equipment and follow the manufacturer's operational instructions;
- For smaller equipment, use the following steps for decontamination:
 - Remove majority of visible gross contamination in EZ;
 - Wash equipment in decontamination solution with a scrub brush and/or power wash heavy equipment;
 - Rinse equipment;
 - Visually inspect for remaining contamination;
 - Follow appropriate personal decontamination steps outlined above.
- All decontaminated equipment shall be visually inspected for contamination prior to leaving the CRZ. Signs of visible contamination may include an oily sheen, residue or contaminated soils left on the equipment. All equipment with visible signs of contamination shall be discarded or re-decontaminated until clean. Depending on the nature of the contaminant, equipment may have to be analyzed using a wipe method or other means.

4.8 Employee Exposure Monitoring

- #### 4.8.1
- Explosive levels, oxygen levels, and airborne contaminants may present potential hazards to HAZWOPER personnel working within controlled work areas and to non-HAZWOPER workers and the general public present outside the controlled work areas.

- 4.8.2 As appropriate, exposure monitoring at HAZWOPER sites will be conducted to determine explosive and oxygen levels, monitor and control employee exposures to airborne contaminants, and to determine and regulate controlled work area boundaries (e.g., support zone, contamination reduction zone, and exclusion zone) for the protection of non-HAZWOPER workers and the general public.
- 4.8.3 Specific exposure monitoring requirements will be established in individual SH&E Plans. Refer to *S3AM-127-PR1 Exposure Monitoring*. All monitoring efforts using direct reading instruments and will remain part of the project file.
- 4.8.4 Work Area Exposure Monitoring
 - Work area exposure monitoring will include breathing zone readings for the maximum exposed worker(s);
 - Results will be used to determine adequacy of PPE (especially respiratory protection). Specific criteria for upgrade/downgrade will be established in the SH&E Plan.
- 4.8.5 Perimeter Exposure Monitoring
 - Perimeter air samples will be collected when the potential exists for airborne contaminants to migrate off-site and will be collected near the work zones when performing work at an active client facility. Refer to *S3AM-127-PR1 Exposure Monitoring*;
 - Perimeter exposure monitoring will be conducted at locations downwind from the project activities at a minimum (also upwind if the potential exists for offsite contamination to migrate onto the site).
- 4.8.6 Exposure results will be posted on site and explained in a safety briefing.
- 4.8.7 Employees will receive a written statement of results within 15 days of receipt from the laboratory.
- 4.8.8 Results of all personal exposure monitoring will be provided to the SH&E department for inclusion in the employee medical records, refer to *S3AM-017-PR1 Injury & Illness Recordkeeping*.

5.0 Records

- 5.1 All forms and documents generated during a HAZWOPER project will be maintained in the project file.
- 5.2 All medical screening and surveillance documentation shall be retained for 30 years.

6.0 Attachments

- 6.1 [S3AM-117-ATT1](#) [Spill Notification Number for North America](#)

Heat Stress

S3AM-113-PR1

1.0 Purpose and Scope

- 1.1 Establishes a Heat Illness Prevention Program to guide employees in preventing heat illness, recognition of the symptoms of heat stress-related illnesses and in taking the appropriate corrective action.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

- 2.1 **Acclimated** – Employees who have developed physiological adaptation to hot environments characterized by increased sweating efficiency, circulation stability, and tolerance of high temperatures without stress. Acclimatization occurs after 7 to 10 consecutive days of exposure to heat and much of its benefit may be lost if exposure to hot environments is discontinued for a week.
- 2.2 **Chemical Protective Clothing (CPC)** – Apparel that is constructed of relatively impermeable materials intended to act as a barrier to physical contact of the Employee with potentially hazardous materials in the workplace. Such materials include Tyvek® coveralls (all types) and polyvinyl chloride coveralls and rain suits.
- 2.3 **Heat Cramps** – A form of heat stress brought on by profuse sweating and the resultant loss of salt from the body.
- 2.4 **Heat Exhaustion** – A form of heat stress brought about by the pooling of blood in the vessels of the skin and in the extremities.
- 2.5 **Heat Rash** – A heat-induced condition characterized by a red, bumpy rash with severe itching.
- 2.6 **Heat Stress** – The combination of environmental and physical work factors that constitute the total heat load imposed on the body.
- 2.7 **Heat Stroke** – The most serious form of heat stress, which involves a profound disturbance of the body's heat-regulating mechanism.
- 2.8 **Sunburn** – Caused by unprotected exposure to ultraviolet radiation present in sunlight that is damaging to the skin (Refer to *S3AM-121-PR1 Non-Ionizing Radiation*). The injury is characterized by red painful skin, blisters, and/or peeling.
- 2.9 **Unacclimated** – Employees who have not been exposed to hot work conditions for one week or more or who have become heat-intolerant due to illness or other reasons.

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-004-PR1 Incident Reporting, Notifications & Investigation
- 3.3 S3AM-010-PR1 Emergency Response Planning
- 3.4 S3AM-121-PR1 Non-Ionizing Radiation
- 3.5 S3AM-208-PR1 Personal Protective Equipment
- 3.6 S3AM-209-PR1 Risk Assessment & Management

4.0 Procedures

4.1 Roles and Responsibilities

4.1.1 Managers

- Evaluate the need for heat illness prevention measures and incorporate as appropriate into the Safe Work Plan or Task Hazard Analysis.
- Allocate sufficient resources for the management of heat illness in the field including the provision of water, a shaded break area, and sufficient schedule to allow for breaks.

4.1.2 Safety, Health and Environment (SH&E) Manager

- Provide heat illness awareness training.
- Assist in developing appropriate work-rest schedules.
- Conduct/support incident investigations related to potential heat stress-related illnesses.

4.1.3 Supervisor

- Identify those tasks that may be most impacted by heat stress and communicate the hazard to the assigned Employees.
- Confirm that Employees have been trained on the recognition of heat illness.
- Confirm that this procedure, along with any applicable Safe Work Plan and/or Task Hazard Analysis (and heat exposure control plan that may be contained therein) are made available to affected Employees.
- Confirm that adequate supplies of appropriate fluids are readily available to Employees.
- Confirm that a proper rest area is available.
- Conduct heat illness monitoring, as applicable.
- Implement the work-rest schedule.
- Confirm that first aid measures are implemented once heat stress symptoms are identified.
- Confirm personnel are physically capable of performing the assigned tasks and are not in a physically compromised condition.
- Report all suspected heat illnesses.

4.1.4 Employee

- Observe each other for the early symptoms of heat illnesses.
- Maintain an adequate intake of available fluids.
- Be familiar with heat stress hazards, predisposing factors, and preventative measures.
- Report to work in a properly vested and hydrated condition.
- Report all suspected heat stress-related illnesses.

4.2 Restrictions

- 4.2.1 The Buddy System is required when working in high heat conditions; Employees shall not work alone.
- 4.2.2 Employees shall not be exposed to levels exceeding those specified for the given work level and work-rest regimen as listed in *S3AM-113-ATT1 Temperature Thresholds*.
- 4.2.3 Clothing corrections shall be applied in accordance with the tables provided in *S3AM-113-ATT1 Temperature Thresholds*.

4.3 Exposure Controls

4.3.1 It shall be determined whether Employees are or may be exposed to hazardous heat levels. The Supervisor shall:

- Conduct a heat stress assessment to determine the potential for hazardous exposure of Employees. Assessment shall include, but not limited to:
 - Ambient temperature.
 - Amount of sunshine (cloudy, clear). Refer to *S3AM-121-PR1 Non-Ionizing Radiation* additional direction concerning ultraviolet radiation exposures.
 - Other radiant heat sources (e.g. motor, fire, etc.).
 - Humidity.
 - Air flow.
 - Amount or type of physical labor being performed,
 - Physical condition of the Employees (e.g., acclimated/not)
 - Protective clothing in use.
 - Referral to *S3AM-113-ATT1 Temperature Thresholds* to assist in determining whether hazardous heat exposures may exist.
- If potential for hazardous exposure is identified, the Supervisor shall develop and implement a heat stress exposure control plan within the Safe Work Plan and/or Task Hazard Analysis. Refer to *S3AM-209-PR1 Risk Assessment & Management*.

4.3.2 If Employees are or may be exposed, the Supervisor shall implement engineering controls (e.g., shelters, cooling devices, etc.) to reduce the exposure of Employees to levels below those specified for the given work level and work-rest regimen as listed in *S3AM-113-ATT1 Temperature Thresholds*.

4.3.3 If engineering controls are not practicable, the Supervisor shall reduce the exposure of Employees to levels below those listed in *S3AM-113-ATT1 Temperature Thresholds* by providing administrative controls, including a work-rest cycle or personal protective equipment, if the equipment provides protection equally effective as administrative controls.

4.3.4 If Employees are or may be exposed, the Supervisor shall provide and maintain an adequate supply of cool, fresh, potable water close to the work area for the use of a heat exposed Employee. Water shall be provided (paid) by the project or program; if Employees purchase their own drinking water because water is not otherwise available on site, they shall be reimbursed.

4.3.5 If an Employee shows signs or reports symptoms of heat stress or strain, they shall be removed from the hot environment and treated by an appropriate first aid attendant on site, if available, or by a physician, refer to *S3AM-113-ATT2 Symptoms & Treatment* for more specifics.

4.4 Heat Stress Planning

4.4.1 Heat stress can be a significant site hazard, especially for Employees wearing CPC. To prepare for emergency response planning, refer to *S3AM-010-PR1 Emergency Response Planning* procedure.

4.4.2 The project and site specific risks need to be planned using the SH&E Plan and the Task Hazard Assessments (THA). Refer to the *S3AM-209-PR1 Risk Assessment & Management* procedure.

4.4.3 The heat a worker is exposed to may be a combination of air temperature, radiant heat, and humidity. The WBGT (wet-bulb globe thermometer) is a useful index of the environmental contribution to heat stress. Because WBGT is only an index of the environment, the contributions of

work demands, clothing, and state of acclimatization shall also be accounted for, as described in the following steps.

- Monitor ambient temperatures and conduct heat stress monitoring in accordance with the location specific SH&E Plan. Revise the heat stress monitoring and controls if there are any reports of discomfort due to heat stress.
- Monitor temperatures in each unique environment in which workers perform work (e.g., take WBGT measurements inside truck cabs for truck drivers, and take separate WBGT measurements in the outdoor area where field employees work, etc.). Follow manufacturer's instructions on proper use of the WBGT.
- Determine if individual workers are acclimatized or un-acclimatized. Full heat acclimatization requires up to 3 weeks of continued physical activity under heat-stress conditions similar to those anticipated for the work. Its loss begins when the activity under those heat-stress conditions is discontinued, or when there is a sustained increase in temperatures of 10 °F (5.6 °C) or more, and a noticeable loss occurs after 4 days. A worker can be considered acclimatized for the purpose of this procedure when they have been exposed to the site conditions (including level of activity) for 5 of the last 7 days.
- Determine the approximate workload of each worker or group of workers. The following examples (Table 1) can be used for comparison:

Table 1
Examples of Activities within Workload Categories

Categories	Example Activities
Resting	Sitting quietly
	Sitting with moderate arm movements
Light	Sitting with moderate arm and leg movements
	Standing with light work at machine or bench while using mostly arms
	Using a table saw
	Standing with light or moderate work at machine or bench and some walking about
Moderate	Scrubbing in a standing position
	Walking about with moderate lifting or pushing
	Walking on level at 3.5 miles/hr (6 km/hr) while carrying 6.6 lbs (3kg) weight load
Heavy	Carpenter sawing by hand
	Shoveling dry sand
	Heavy assembly work on a non-continuous basis
	Intermittent heavy lifting with pushing or pulling (e.g., pick-and-shovel work)
Very Heavy	Shoveling wet sand

- Determine the approximate proportion of work within an hour during a typical shift. Typically, the initial work schedule will be 60 minutes of work per hour (100 percent work) with a small break in the morning and afternoon, as appropriate, and a 30-minute lunch break mid-day.
- For workers wearing cloth coveralls (e.g., Nomex fire resistant clothing), add 3 to the measured WBGT. For impermeable clothing, such as Tyvek or Saranex, the WBGT procedures cannot be used. For these situations, workers should begin physiological monitoring as soon as the temperature in the work area exceeds 70°F (21°C).
- Use the collected information to develop appropriate work to rest schedules as detailed in *S3AM-113-ATT1 Temperature Threshold*.

4.4.4 Given the work demands (light, moderate, heavy or very heavy), heat of the work environment, and such aspects as PPE in use, workload will be adjusted appropriately to allow for proper acclimation.

- This is the process by which the body "gets used to" hot work environments. This is achieved by slowly increasing workloads.
 - New and returning Employees (absent one week or more) who have not had time to acclimatize may be more susceptible to heat related illnesses, even in seemingly low risk heat exposures.
 - All Employees shall be allowed time to acclimatize in the event of a heat wave. All Employees assigned to a new process with additional heat exposures shall be allowed to acclimatize.
 - Minimize workload and gradually increase as tolerance is built up. Allow for more frequent breaks.
 - While acclimatization normally takes approximately 5 to 7 days, heightened monitoring of these Employees will be maintained for the first 14 days.
- 4.4.5 Employees shall be instructed in the recognition of heat stress symptoms, the first aid treatment procedures for severe heat stress, and the prevention of heat stress injuries. Employees shall be encouraged to immediately report any heat stress that they may experience or observe in fellow Employees. Supervisors shall use such information to adjust the work-rest schedule to accommodate such problems.
- 4.4.6 Wherever possible, a designated break area should be established in an air conditioned space, or in shaded areas where air conditioning is impractical. The break area should be equipped to allow Employees to loosen or remove protective clothing, and sufficient seating should be available for all Employees. During breaks, Employees shall be encouraged to drink plenty of water or other liquids, even if not thirsty, to replace lost fluids and to help cool off. Cool water should be available at all times in the break area, and in the work area itself unless hygiene/chemical exposure issues prevent it.
- 4.5 Symptoms and Treatment
- 4.5.1 Refer to *S3AM-113-ATT2 Symptoms & Treatment*.
- 4.5.2 Employees who exhibit ANY signs of significant heat stress (e.g., profuse sweating, confusion and irritability, pale, clammy skin) shall be relieved of all duties at once, made to rest in a cool location, and provided with large amounts of cool water.
- 4.5.3 Anyone exhibiting symptoms of heat stroke (red dry skin, or unconsciousness) shall be taken immediately to the nearest medical facility. Steps shall be taken to cool the person during transportation (clothing removal, wet the skin, air conditioning, etc.).
- 4.5.4 Severe heat stress (heat stroke) is a life-threatening condition that shall be treated by a competent medical authority.
- 4.6 Prevention
- 4.6.1 Requirements for working in extreme heat may be triggered by a regulatory established criteria (e.g. CAL/OSHA requires high heat procedures when temperature equals or exceeds 95°F) or as a result of a hazard analysis assessing various contributory factors (refer to *S3AM-113-ATT1 Temperature Thresholds*). Employees working in extreme heat or sun should understand and apply the following guidelines for preventing and detecting heat exhaustion and heat stroke.
- When possible, begin hydrating at least three days prior to working in high heat conditions.
 - Review the heat stress exposure control plan within the Safe Work Plan and/or Task Hazard Analysis.
 - If the supervisor is not immediately available confirm a reliable method of communication is in place to allow for contact with supervision. In the absence of cellular reception a satellite phone or similar device may be required.

- Take frequent short breaks in areas sheltered from direct sunlight; eat and drink small amounts frequently.
- Try to schedule work for the coolest part of the day, early morning and evening.
- Avoid strenuous physical activity outdoors during the hottest part of the day.
- Avoid sudden changes of temperature. Refer to *S3AM-113-ATT1 Temperature Thresholds*.
- Air out a hot vehicle before getting into it.
- Obtain medical direction if taking diuretics during hot weather (a lower dose may be necessary).
- When working in heat, drink 1 quart of water per hour of work.
- Avoid caffeine and alcohol as they increase dehydration.
- Monitor urine frequency and color to detect dehydration. Refer to the *S3AM-113-ATT3 Dehydration Chart*.
- The Buddy System is required when working in high heat conditions to enable effective communication and cross-observation for indications of heat stress.
- Initiate emergency response procedures when necessary, including contacting emergency medical services as appropriate and in accordance with the Emergency Response Plan.

4.6.2 Personal Protective Equipment

- Review the *S3AM-208-PR1 Personal Protective Equipment* procedure.
- Wear a hat and light-colored, loose-fitting clothing to reflect the sun.
- Apply sunscreen to exposed skin (SPF 30 or greater, follow directions on label).
- Wear sunglasses with UV protection.
- Pack extra water to avoid dehydration (try freezing water in bottles overnight to help keep the water cooler for longer during the day).

4.7 Work-Rest Schedule Practices

- 4.7.1 Intake of fluid will be increased beyond that which satisfies thirst, and it is important to avoid "fluid debt," which will not be made up as long as the individual is sweating.
- Two 8-ounce glasses of water should be taken prior to beginning work, then up to 32 ounces (1 quart) per hour during the work shift; fluid replacement at frequent intervals is most effective.
 - The best fluid to drink is water; liquids like coffee or soda do not provide efficient hydration and may increase loss of water.
 - If commercial electrolyte drinks (e.g., Gatorade) are used, the drink should be diluted with water, or 8 ounces of water should be taken with each 8 ounces of electrolyte beverage.
- 4.7.2 Additional salt is usually not needed and salt tablets should not be taken.
- 4.7.3 Replacement fluids should be cool and fresh, but not cold.
- 4.7.4 Breaks will be taken in a cool, shaded location, and any impermeable clothing should be opened or removed.
- A relatively cool, shaded area shall be provided for breaks when working in hot environments. For hazardous waste sites, the rest area should be located in the support zone adjacent to the contamination reduction zone, situated so that part of it is in the decontamination area so workers can take breaks without going through full decontamination.

- If shade is not available, shaded areas shall be constructed. This same type of canopy can be set up to shade personnel performing various types of work in hot weather.
- Cooling measures other than shade (e.g., misting, air conditioned break areas, air conditioned vehicles, etc.) can be used in lieu of shade provided it can be demonstrated that they are at least as effective in cooling employees.
- Employees should have access to these rest areas at break times and at any other time when suffering from heat illness or believing a preventive recovery period is needed.

4.7.5 Dry clothing or towels will be available to minimize chills when taking breaks.

4.7.6 Manual labor will not be performed during breaks, other than paperwork or similar light tasks.

4.7.7 Other controls that may be used include:

- Scheduling work at night or during the cooler parts of the day (6 am–10 am, 3 pm–7 pm).
- Erecting a cover or partition to shade the work area.
- Auxiliary cooling - wearing cooling devices beneath protective garments, but over any underclothing.
 - If cooling devices are worn, only physiological monitoring will be used to determine work activity.
 - These vests typically provide cooling via one of two methods: the use of ice or other frozen media, or the use of a vortex cooler. Each method has its advantages and disadvantages.
 - The frozen media vest requires a means for freezing the media, and the media (usually water or "blue ice") will melt, requiring replacement.
 - The vortex cooler tends to cool more uniformly. Instead of frozen media, this vest uses the expansion of compressed air to cool the wearer. The drawback is the compressed air requirement, but this is negated when the wearer is already using an airline respirator supplied by a compressor. A vortex cooler should not be supplied from air cylinders, as this will draw down the cylinders rapidly.
- Auxiliary cooling should be considered when the following conditions exist:
 - Ambient temperature over 80°F (26°C).
 - Workers are wearing impermeable garments (i.e., Tyvek, Saranex, Chemrel, etc.).
 - It is desirable to have long work shifts with minimum interruption.

4.8 Evaluating the Work-Rest Schedule's Effectiveness

4.8.1 Once a work-rest schedule is established, the Supervisor shall continually evaluate its effectiveness through observation of Employees for signs/symptoms of heat stress. Have workers assess themselves and their body's reaction to the heat and work conditions (self-assessment), and report any signs or symptoms of heat illness. These can include nausea or dizziness, heat cramps, extreme thirst, or very dark urine.

4.8.2 Measurement or physiological monitoring of each Employee's vitals (e.g., pulse, blood pressure, and temperature) can provide additional information in determining if the schedule is adequate. Refer to *S3AM-113-ATT1 Temperature Thresholds* for additional guidance on when physiological monitoring should be conducted.

4.8.3 Frequency of physiological monitoring is increased or decreased depending upon such factors as worker fitness, acclimatization, temperature of the work environment, type of PPE, etc.

Based on the results of the physiological monitoring and on the workers' self-assessments, the work period may be adjusted as follows:

- The work period may be increased (generally, by 5- to 10-minutes intervals, up to a maximum of 4 hours) if the results of the first 2 hours of the physiological monitoring and the workers' self-assessments indicate that workers are recovering adequately (see below), and on the judgment of the SH&E Manager.
 - The work period shall be decreased if the results of the physiological monitoring and the workers' self-assessment indicate that workers are NOT recovering adequately (see below).
- 4.8.4 If physiological monitoring is conducted, the Employee and/or the SH&E Manager (or appropriate designate) shall measure and record body temperature and pulse rate as described below.
- 4.8.5 Monitor body temperature to determine if Employees are adequately dissipating heat build-up. Ear probe thermometers which are adjusted to oral temperature (aural temperature) are convenient and the preferred method of measurement. Determine work/rest regimen as follows:
- Measure oral body temperature at the end of the work period. Oral body temperatures are to be obtained prior to the employee drinking water or other fluids.
 - If temperature exceeds 99.6°F (37.5°C), shorten the following work period by 1/3 without changing the rest period.
 - If, at the next rest period, temperature still exceeds 99.6°F (37.5°C), the worker should not be allowed to continue work until repeated temperature measurements are in the acceptable range (i.e., less than 99.6°F). Do not leave the worker alone during the recovery time. Watch for signs of heat illness and be prepared to implement emergency response as necessary.
 - Do not allow a worker to wear impermeable PPE when his/her oral temperature exceeds 100.6°F (38.1°C).
- 4.8.6 At the start of the workday each Employee's baseline pulse rate (in beats per minute [bpm]) is determined by taking a pulse count for 15 seconds and multiplying the result by four or by using an automated pulse count device. Pulse rates can then be measured at the beginning of each break period and two minutes thereafter to determine if the rest period allows for adequate recovery.
- Take the radial (wrist) pulse as early as possible in the rest period and determine the worker's heart rate in beats per minute. The heart rate is determined by counting the pulse for ten seconds and multiplying the number by 6 to get the beats per minute. Record this as P1.
 - Wait 2 minutes and repeat the pulse measurement. Record this as P2.
 - If P1 is greater than or equal to 110 beats per minute (bpm) and if (P1 – P2) is less than or equal to 10 bpm (indicating that workers are not recovering adequately), shorten the next work cycle by 1/3 without changing the rest period.
 - At the next rest period, if P1 is still equal to or greater than 110 bpm, and if (P1 – P2) is still less than or equal to 10 bpm, shorten the following work cycle by 1/3 without changing the rest period.
 - At the third rest period, if P1 is still equal to or greater than 110 bpm and (P1 – P2) is still less than or equal to 10 bpm, the worker should not be allowed to continue work until repeated pulse measurements are in the acceptable range (i.e., P1 is less than 110 bpm and (P1 – P2) is greater than 10 bpm). Do not leave the worker alone during the recovery time. Watch for signs of heat illness and be prepared to implement emergency response as necessary.
- 4.8.7 Use of an automated or similar blood pressure device will be used to assess each Employee's blood pressure at the beginning and end of each break period to determine if the rest period allows adequate cooling by applying the following criteria:
- If the blood pressure of an Employee is outside of 90/60 to 150/90, then the Employee will not be allowed to begin or resume work; extend the break period by at least five minutes, at the end of which blood pressure rates will be re-measured and the end-of-break criteria again applied.

- 4.8.8 All physiological monitoring of heat stress will be documented using *S3AM-113-FM1 Heat Stress Monitoring Log*.

4.9 Training

- 4.9.1 Employees and their Supervisors that may be exposed to the hazard will be trained and oriented to the hazard and the controls prior to work commencing.
- 4.9.2 Those Employees, including Supervisors, potentially exposed to heat stress will receive training, refer to the *S3AM-003-PR1 SH&E Training* procedure. Training will include, but is not limited to:
- Sources of heat stress (environmental and personal), influence of protective clothing, and importance of acclimatization;
 - How the body handles heat and acclimatization;
 - Recognition of heat-related illness symptoms;
 - Preventative/corrective measures including, but not limited to;
 - Employees will be informed of the harmful effects of excessive alcohol consumption in the prevention of heat stress.
 - All Employees will be informed of the importance of adequate rest and proper diet in the prevention of heat stress.
 - First aid procedures for heat stress-related illnesses; and
 - Immediate reporting of any heat-related incident (injury, illness, near-miss), refer to the *S3AM-004-PR1 Incident Reporting, Notifications & Investigation* procedure.

5.0 Records

- 5.1 None

6.0 Attachments

- 6.1 [S3AM-113-ATT1 Temperature Thresholds](#)
- 6.2 [S3AM-113-ATT2 Symptoms & Treatment](#)
- 6.3 [S3AM-113-ATT3 Dehydration Chart](#)
- 6.4 [S3AM-113-FM1 Heat Stress Monitoring Log](#)

Marine Safety & Vessel Operations

S3AM-333-PR1

1.0 Purpose and Scope

- 1.1 Establishes the procedure for AECOM employees who perform work on boats and vessels.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

Refer to *S3AM-333-ATT1 Nautical Terminology* for more definitions.

- 2.1 **Small Boat** – A boat less than 18 feet (5.5 meters) in length including canoes, kayaks, rafts, and dinghys with an outboard motor.
- 2.2 **Mid-size Boat** – A boat greater than 18 feet (5.5 meters) but less than 26 feet (8 meters) in length, including single and pontoon-style hulls, barges, or other platforms.
- 2.3 **Large Vessel** – A boat or vessel larger than 26 feet (8 meters) in length.
- 2.4 **Boat or Vessel Operator** – Person responsible for the overall safe operation of the boat/vessel.

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-208-PR1 Personal Protective Equipment
- 3.3 S3AM-209-PR1 Risk Assessment & Management
- 3.4 S3AM-301-PR1 Confined Spaces
- 3.5 S3AM-315-PR1 Working On & Near Water

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Safety, Health and Environment (SH&E) Manager

Provide training and technical guidance to operation, including the following:

- Approve SH&E plans.
- Approve personnel assigned safety duties.

4.1.2 Manager

Responsible for the overall success of a project and the performance of employees engaged in project activities. The Manager identifies and implements all appropriate SH&E procedures. Additional responsibilities include the following:

- Confirm that subcontractors selected to support project operations have been approved by the SH&E Manager.
- Select an appropriate boat/vessel for the planned work activities.
- Obtain approval from the SH&E Manager for the operation of any vessel in offshore, ports or harbors, navigation channels, or waterways handling commercial ship traffic.
- Develop and submit a site-specific SH&E plan, Task Hazard Assessment, Float Plan and other SH&E Planning Documents for review and approval by the SH&E Manager.
- Allocate appropriate resources, including emergency and safety equipment, to complete the

project as planned.

- Designate a Marine Safety Officer to implement and maintain safe work practices and procedures. Marine Safety Officers are responsible for the following:
 - Implement and monitoring safe work practices specified by this procedure and supporting SH&E documentation.
 - Conduct marine safety briefings and inspections as needed.
 - Conduct field verification of the competency of boat/vessel operators and field staff.

4.1.3 **Boat/Vessel Operator**

- Maintain current boating/vessel licenses as required by local, State, Provincial, and Federal regulations and standards.
- Operate boats/vessels in accordance with this procedure and as required by local, State, Provincial, and Federal regulations and standards.

4.1.4 **Marine Safety Officer**

- Shall be designated by the Manager and approved by the SH&E Manager.
- Have experience in boat and vessel operations similar to those planned for the operation.

4.1.5 **Staff**

- Comply with the safe work practices specified in this procedure and all other applicable SH&E policies.
- Verify that they meet training and qualification requirements, and reporting deficiencies to their Supervisor and Manager.
- Use equipment that has been inspected, and use equipment only as intended.
- Follow all safe work practices in this procedure, in the project SH&E documents, as required by local, State, Provincial, and Federal regulations or standards, and as instructed by the Marine Safety Officer or Vessel Operator.
- Immediately report incidents, near misses, unsafe acts and conditions when they occur to the Marine Safety Officer and/or the responsible supervisor.

4.2 Training and Qualifications

4.2.1 In accordance with *S3AM-003-PR1 SH&E Training*, all personnel working aboard boats/vessels shall complete and maintain current training applicable to the anticipated tasks and appropriate to the hazards. Training may include, but is not limited to:

- Safe Boating Course (approved by SH&E Manager).
- CPR/First Aid certification.
- Hazardous Waste Operations and Emergency Responses training (if marine operations involve hazardous waste or the response to a hazardous waste emergency response).
- Hepatitis A vaccination (if marine operations involve sampling sediments or surface waters with contamination from sewage).
- Fire extinguisher training (if a fire extinguisher is required on board).

4.2.2 Vessel Operators shall have completed and maintain current:

- All training and qualification requirements noted above for all personnel working aboard boats/vessels.
- Field competency verification training or documented experience with operating the boat/vessel and that they understand all applicable marine safety regulations.
- Maintain current boat/captain licenses per local, state, provincial, and federal regulations and standards.

4.3 General Requirements

- 4.3.1 All boats and vessels shall be operated by a qualified Vessel Operator (e.g., Marine Operations Superintendent, Master Mariner, Barge Captain, or similar authority and title) in accordance with local, State, Provincial, and Federal Marine Safety Laws.
- 4.3.2 Vessels operated by AECOM personnel shall be owned or rented by AECOM, client, or prime contractor. Use of personal equipment is prohibited.
- 4.3.3 Any vessel carrying more than 12 passengers (6 passengers in the U.S.) shall carry a certificate of inspection for the safe carriage of passengers. Towing vessels used in marine construction are required to be operated by a licensed Master Mariner. Some barges carrying cargo or cranes may be required to be certificated (inspected) by the national maritime authority or Coast Guard.
- 4.3.4 Confirm the requirements of *S3AM-315-PR1 Working On & Near Water* are complied with.
- 4.3.5 All tasks performed aboard a boat/vessel shall be assessed for hazards, and hazards shall be controlled, refer to *S3AM-333-ATT2 Boating Safe Work Practices*. Assessment and controls shall be documented in the Task Hazard Assessment and SH&E Plan, refer to *S3AM-209-PR1 Risk Assessment & Management*, *S3AM-333-ATT4 Float Plan* and *S3AM-333-ATT6 Emergency Response Procedures*.
- 4.3.6 Personal Protective Equipment shall be selected based on the task-specific hazard assessment, refer to *S3AM-208-PR1 Personal Protective Equipment* and *S3AM-333-ATT5 Marine Safety Equipment*.
- 4.3.7 Employees performing tasks involving work on larger vessels, barges, or boats, who are constantly protected by guardrail systems, nets, or body harness systems are deemed to be adequately protected from the danger of drowning, and are not required to wear Personal Floatation Devices (PFD) unless otherwise required by law. At times required by law, or when conditions necessitate, all persons on the boat will wear an appropriate PFD. A PFD with insulating properties may be required during work around cold water. Additional hazards exist when working around or over water. Refer to *S3AM-315-PR1 Working On & Near Water*.
- 4.3.8 All boats and vessel will be outfitted with safety equipment as required by local, state, provincial, and federal regulations or standards, and as identified in the task-specific hazard assessment.
 - Lifesaving equipment and firefighting equipment may be required above regulatory minimums in light of operations, construction activities, or increased worker population.
 - Workers may be required to carry additional safety equipment (e.g., tool to cut anchor line in an emergency, etc.).
- 4.3.9 Vessels working offshore shall be sized to withstand and remain stable through all forms of expected weather conditions, refer to *S3AM-333-ATT3 Small Boat Operation* and *S3AM-333-ATT7 Hazardous Weather Operations*. Local weather, tide, current conditions, and navigational needs shall be evaluated as a part of project planning.
- 4.3.10 All boats/vessels equipped with propulsion machinery shall be licensed and registered in accordance with local, state, provincial, and Federal regulations or standards.
- 4.3.11 Should the vessel have locations designated as confined spaces, they shall be managed in accordance with *S3AM-301-PR1 Confined Spaces*.
- 4.3.12 Chartered or subcontracted boats/vessel or operators shall be evaluated by the Manager for overall suitability for the intended task. Charters/subcontractors are responsible for providing qualified operators and licensed and inspected boats/vessels and for stocking and maintaining emergency supplies and equipment refer to *S3AM-333-ATT8 Charters & Subcontractors*.
- 4.3.13 Impacts to marine traffic shall be evaluated as a part of project planning. Notification of the Coast Guard or other jurisdictional agency shall be made, as required by local, state, provincial, and federal regulations and standards. Additional notifications to other vessels via day shapes may be necessary.
- 4.3.14 Work in security zones and security sensitive areas (near bridges, reservoirs, etc.) shall be

performed only with the authorization of governing security agency(s).

- 4.3.15 For AECOM operations involving construction activities on rivers or in harbors, construction activities located offshore, and scientific surveys using a chartered or contracted ship on inland waters or on the ocean, a competent person experienced in the discipline shall be placed in charge of the operation, and shall be designated in writing as the Marine Safety Officer in the SH&E plan or equivalent document.
- 4.3.16 A daily safety inspection will be conducted by the Marine Safety Officer prior to beginning marine operations. The inspection criteria shall be developed as a part of project SH&E documentation.
- 4.3.17 A daily safety briefing of all field staff and operators shall be conducted by the Marine Safety Officer prior to beginning marine operations. The daily safety briefing shall include, at a minimum:
 - Review of planned activities, including the associated Task Hazard Assessment;
 - Review of emergency procedures, including the location and operation of emergency supplies;
 - Discussion of personal protective equipment required for planned activities; and
 - Opportunity for field staff to ask questions.

5.0 Records

- 5.1 Float plans and other documents with planning and response will be retained in the project files.

6.0 Attachments

- 6.1 [S3AM-333-ATT1 Nautical Terminology](#)
- 6.2 [S3AM-333-ATT2 Boating Safe Work Practices](#)
- 6.3 [S3AM-333-ATT3 Small Boat Operation](#)
- 6.4 [S3AM-333-ATT4 Float Plan](#)
- 6.5 [S3AM-333-ATT5 Marine Safety Equipment](#)
- 6.6 [S3AM-333-ATT6 Emergency Response Procedures](#)
- 6.7 [S3AM-333-ATT7 Hazardous Weather Operations](#)
- 6.8 [S3AM-333-ATT8 Charters & Subcontractors](#)

Working On & Near Water

S3AM-315-PR1

1.0 Purpose and Scope

- 1.1 Establishes the minimum requirements and guidance for AECOM personnel assigned to projects that place them at risk of falling into water where a drowning hazard exists (e.g., more than 3 feet / 1 meter deep, fast-moving stream, water body with soft bottom creating entrapment hazard), including working ashore, near to, or over water or ice.
- 1.2 Employees performing tasks involving work on or under bridges, or on larger vessels, barges, or boats, who are constantly protected by guardrail systems, nets, or body harness systems are deemed to be adequately protected from the danger of drowning, and are not required to wear life jackets or buoyant work vests.
- 1.3 Projects conducted on a ship at sea or in port may not be required to comply with parts of this procedure provided:
 - AECOM can demonstrate the hazard and related controls as identified in this procedure are adequately addressed through controls established by another controlling entity (e.g. ship owner/operator, port authority, etc.) and these are available to AECOM personnel.
 - If AECOM cannot demonstrate adequate controls are in place, the related requirements of this procedure shall be met.
- 1.4 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

- 2.1 **PFD** – Personal Flotation Device
- 2.2 **Life Jacket** – A personal flotation device that will turn over an unconscious worker in the water so their face and nose are not submerged.
- 2.3 **USCG** – United States Coast Guard
- 2.4 **Lifebuoy** – A throwable buoyant rescue ring with 90 feet (28 meters) buoyant line attached.

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-208-PR1 Personal Protective Equipment
- 3.3 S3AM-209-PR1 Risk Assessment & Management
- 3.4 S3AM-333-PR1 Marine Safety & Vessel Operations
- 3.5 S3AM-334-PR1 Diving

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Manager

Responsible for the overall success of a project and the performance of employees engaged in project activities (with the support of Supervisors), and as follows:

- Confirm that all appropriate Safety, Health and Environment (SH&E) procedures are identified and implemented and their applicability during the planning stage of field investigation projects.
- Allocate appropriate resources to implement the required measures.

- Designate a field staff person to implement and maintain these measures, maintain related documentation, and to communicate with appropriate parties as necessary.
- Consult with the purchasing department on the appropriate vendors for rentals/leases.
- Confirm that boat/watercraft rental/leasing vendors have appropriate paperwork (licenses, insurance, maintenance records, orientations, etc.).
- Confirm that the project is properly staffed with trained employees.
- Require that at least one employee trained in cardiopulmonary resuscitation (CPR) and first aid is on site during work activities.
- Designate at least one employee on site to respond to water emergencies and, as applicable, operate the rescue boat at times when there are employees above, in, or near water.
- Develop and submit a SH&E Plan and other relevant SH&E planning documents for review and approval by the SH&E Manager.
- Develop a written section in the SH&E Plan (or equivalent document) to address worker safety, water rescue, and personnel transfer procedures as required in this standard.
- Confirm Task Hazard Assessments (THA) are completed prior to tasks commencing.

4.1.2 **SH&E Manager**

Responsible for providing support to the Manager and his/her designee in the evaluation of safety and health risks and the identification of applicable policies, procedures, and appropriate precautions, and as follows:

- Review all project related SH&E Plans and THAs as required.
- Provide access to safety records, including training records, for field staff.
- Provide support to Manager.

4.1.3 **Supervisors**

Responsible for verifying current status of applicable staff's training and equipping them for the work at hand, and as follows:

- Conduct daily safety meetings to include a review of the hazards and control measures associated with working over/near water. Refer to *S3AM-209-PR1 Risk Assessment & Management*.
- Train employees on their responsibilities, the hazards and the control measures associated with working over/near water.
- Perform SH&E inspections.
- Confirm that all safety issues and equipment deficiencies are properly corrected, and that the proper equipment is available to the field staff to safely meet the goals and quality objectives of the project.

4.1.4 **Employees**

Responsible for complying with the safe work practices specified in this policy and all other applicable SH&E policies or procedures and reporting all unsafe working conditions, and as follows:

- Review, contribute to, and sign the SH&E Plan prior to beginning the project and whenever new tasks or environmental changes occur.
- Review, contribute to, and sign the THA prior to initiating the associated task.
- Confirming that their SH&E training is up to date.
- Confirming daily that equipment is properly maintained and functioning.
- Confirm they wear all required Personal Protective Equipment (PPE).

4.2 **General Safety Considerations**

4.2.1 During project preparation, consideration shall include, but not be limited to:

- The location and nature of the site.
 - Type of water hazard.
 - Underwater hazards and structures.
 - Access to the worksite and/or water body.
 - Scope of work.
 - Equipment to be used
 - Local climate.
- 4.2.2 The information shall be considered when determining the appropriate controls, PPE, and level of emergency preparedness that is required. All projects working near water hazards shall have an appropriate SH&E Plan and THA prepared. Refer to *S3AM-209-PR1 Risk Assessment & Management*.
- 4.2.3 PPE specified in the SH&E Plan and THA is to be worn as required, to meet the specific regulations of the work area, including as applicable, local and Federal legislation.
- 4.2.4 Whenever there exists the possibility of falling into water, personnel shall be attired in a USCG approved Type III or Type V PFD or Life jacket. Refer to *S3AM315-ATT1 Personal Floatation Devices*. The vest shall be properly sized for the individual and shall be secured at all times. For cold water conditions (water temperature less than 55 degrees Fahrenheit [13 degrees Celsius]), a USCG-approved Shallang/Mustang suit shall be worn to protect personnel from risks of cold water immersion.
- 4.2.5 For work at night, Type II, III, or V PFD should have a chemical light, or other appropriate survival light attached to facilitate rescue. All PFDs shall have reflective tape on them to facilitate visibility at night. For work in non-US areas, the PFD shall be approved by the appropriate local authority, or be approved as an International Maritime Organization (IMO)/Safety of Life at Sea (SOLAS) lifesaving device. This shall include either a Type II buoyant vest or a Type III flotation aid.
- 4.2.6 Swimming is prohibited, unless it is being conducted by certified divers in the completion of their assigned task, or to prevent a serious injury or loss of life in a person in a water/person overboard emergency.
- 4.2.7 The buddy system shall be utilized whenever there is the possibility of falling into water, in which two persons operate as a single unit in order to monitor and assist each other in performing tasks.
- 4.2.8 When work is performed in water where a drowning hazard exists, or on ice, at least one attendant and/or rescue boat operator will be utilized and be available to immediately respond to an emergency and/or launch the rescue boat. The attendant and/or boat operator are not to be assigned other duties beyond safety and rescue.
- 4.2.9 Conducting shoreline work alone should be avoided, unless constant communications is maintained between Staff and Supervisors, and prior approval by the Manager is granted.
- 4.2.10 Confirm a throwable lifebuoy with required rescue line attached (Type IV PFD) is available.
- 4.2.11 Confirm any additional equipment (e.g., sounding alarms, lifting gear, or rescue boat) as required by legislation is immediately available to recover an individual from the water.
- If the shortest dimension of the water body is greater than the length of line attached to the throw buoy, a skiff or boat shall be available to facilitate a rescue.
 - The rescue boat shall be capable of being launched by one person, and shall be properly equipped, and the operator shall be properly qualified per *S3AM-333-PR1 Marine Safety & Vessel Operation*.
 - If a rescue boat is not feasible due to site conditions (e.g., water depth), alternate rescue planning shall be provided in the safety plan.
- 4.3 Personal Protective Equipment (PPE)

- 4.3.1 PPE shall be selected based on the SH&E Plan and THA, and in accordance with the S3AM-208-PR1 *Personal Protective Equipment*.
- 4.3.2 The minimum PPE required for wading in water above the knees includes:
 - Personal Flotation Devices or lifejackets shall be worn by all workers who are exposed to the danger of drowning in water deep enough for the lifejacket to be effective.
 - All inflatable PFD or life jackets shall be approved and have documented regular inspections.
 - Shallang/Mustang suits – In water temperatures below 55 degrees Fahrenheit (13 degrees Celsius) (regardless of air temperature) personnel are required to wear a USCG-approved Shallang/Mustang jacket or full-flotation suit, depending on field conditions. This requirement will replace the need for a wearable PFD as these suits (if properly maintained) will provide adequate flotation.
 - Waders shall have a slip resistant sole suitable for the substrate.
 - Eye protection shall be worn to reduce glare.
 - Wading pole shall be used for supporting and testing the substrate before wading.
- 4.3.3 Confirm rescue equipment is on site that is appropriate to the situation (e.g., life buoys with 90 feet [28 meters]) of retrieval line, rescue boat, sounding device). Extra buoys shall be 200 feet (60 meters) or less from each other. During night operations, ring buoys shall have a USCG or SOLAS equivalent water light attached.
- 4.3.4 Confirm appropriate emergency supplies are available at the location (e.g. blankets, first aid kit).
- 4.3.5 Immersion suits, or survival suits as they are often called, can significantly improve survival time in cold water.
 - Recognizing that hypothermia is a major factor in lives lost at sea, the USCG requires that vessels operating in offshore waters north of 32 degrees North latitude carry an immersion suit for each person aboard.
 - These suits are to be used in place of a Type I PFD in an abandon ship situation.
 - It is recommended that personnel familiarize themselves with their use and practice donning the suit before leaving the dock. It is recommended that personnel be able to get into an immersion suit in under a minute.
 - If necessary to abandon ship, personnel, attired in an immersion suit with head covered in a hat, should enter the water slowly. If possible, keep the head out of the water.
- 4.3.6 Suits should be stored in a clean and dry location. Avoid stacking or compressing the suits in storage as it may result in a loss of buoyancy. Federal regulations require that immersion suits be stowed so that they are readily accessible to the individual for whom they are intended, from both the individual's normal work area and berthing area. If there is no location readily accessible to both areas, then a suit shall be stowed at each location.
- 4.4 Land-based water work (shoreline/bridge/pier – includes wading)
 - 4.4.1 All shore work shall be performed in accordance with a "Buddy System".
 - 4.4.2 If sampling near or in flowing water environments, be aware of slippery or steep banks and fast currents. If the current is fast or the water looks deeper than knee height, do not enter the water. If you must enter the water, a PFD and restraining system shall be worn and secured to the bank for your retrieval in the event of an emergency.
 - 4.4.3 Whenever possible, positive controls in the form of fencing or barricades should be considered for long-term waterfront projects to form a security perimeter 10 feet in from the water's edge to prevent field staff from being exposed to water hazards.
 - 4.4.4 Field staff involved in sampling contaminated sediments or surface waters or conducting shoreline surveys may require a Hepatitis A and/or tetanus vaccination depending on site conditions and are advised to consult with their Safety, Health and Environment Manager. An Occupational Safety

and Health Administration 40-hour HAZWOPER may be required for field staff working on site if warranted by the Project.

- 4.4.5 Take special care on slippery rocks along shorelines, lakeshores, riverbanks, and creeks. Always look ahead at the ground when walking around the water's edge and avoid stepping on stones that have algal growth, especially those in intertidal areas, as these are extremely slippery. It is suggested that workers not be permitted to access areas where these slip/fall hazards exist, especially in locations containing tidal water flow.

4.4.6 Personal Protective Equipment:

- AECOM requires that whenever there exists the possibility of falling into water, field staff shall be attired in a USCG-approved Type III or Type V work vest. This includes when working near fluid-filled tanks, ponds, lagoons, or natural waterways.
- The PFD vest shall be properly sized for the individual and shall be secured at all times. Prior to and after each use, the PFD/suit shall be inspected for defects, which may alter their strength or buoyancy. Defective units shall be discarded and replaced.
- Staff protective gear shall include long pants with adequate puncture resistance, and gloves appropriate to the hazard(s) (e.g., puncture resistant gloves such as Kevlar when sampling, picking up, or manipulating ground cover). It is recommended that field staff use a rake to move ground cover and debris and not touch these items directly by hand whenever possible.

4.5 Wading in a shallow stream or water body:

- 4.5.1 Chest waders may not be worn when working along, over, or in moving waters; or in waters influenced by tides or acted upon by waves when water depths exceed knee height unless specifically approved by the Manager.

- Chest waders may be worn in still waters in water depths up to the waist if bottom conditions are firm and well understood.
- Chest waders shall never be worn aboard a watercraft of any kind unless specifically approved by the SH&E Manager and required by the task (e.g., rubber or neoprene waders for electrofishing to protect from electric shock).

- 4.5.2 Always proceed upstream so that the wading team is walking into clear water (no turbidity caused by walking), there is good visibility for any debris floating downstream, and there is a reduced risk that the wading team will be pushed against debris or pushed into a deep hole by the current.

- 4.5.3 Wading in water deeper than knee height shall be undertaken as a two-person crew unless alternative suitable measures to control the hazard are employed. If conditions or legislation warrant a "rescue team," then an appropriately sized crew should be used, with the rescue team stationed on the shore with the appropriate rescue equipment, as per the site-specific safety plan.

4.5.4 Wading will not occur in the following circumstances:

- If the water is too turbid or too deep to see tripping hazards or deep holes.
- If it appears the bottom is composed of soft sediments where stepping in may result in sinking, or if the bottom consists of clay where slipping is likely.
- If large woody debris is abundant and will be difficult to step over or move around.
- If the water is over the waist of the shortest person on the wading teaming. This does not preclude wading in water bodies that have shallow shorelines that grade into deeper waters. By not wading over waist level there will be approximately 12 Inches (30 centimeters) of "safety distance" on the chest waders (if worn), should a member of the wading team step or slip into a deeper area.
- If there is a risk of the current pushing a member of the team downstream.
- If there is a risk of exposure to dangerous wildlife, or other hazardous conditions, unless appropriate mitigation procedures are in place.

4.6 Cold Water Operations

- 4.6.1 Cold water operations are defined as any situation that exposes an individual to falling into water that has a temperature of 55 degrees Fahrenheit (13 degrees Celsius) or less.
- 4.6.2 Sudden immersion in cold water can induce a gasping reaction and uncontrolled breathing which may cause the victim to ingest water and begin choking, experience cardiac arrest, and other physical body conditions all of which can result in a quick drowning.
- 4.6.3 Cold water incapacitation precedes hypothermia, making swimming and grasping for safety extremely difficult. So while death by hypothermia may occur in roughly one hour in a water temperature of 55 degrees Fahrenheit (13 degrees Celsius), incapacitation due to failing muscle function will occur in as little as 10 minutes, so regardless of your age, physical conditioning, or ability to swim – your odds of survival are greatly enhanced if you wear a life jacket.
- 4.6.4 AECOM requires personnel to wear a USCG-approved Shallang / Mustang suit at all times whenever there is the risk of falling into cold water. Employees working in these conditions view a training video on the physiological effects of cold water immersion found at: <http://www.coldwaterbootcamp.com>.
- 4.6.5 Consideration should be given to the use of immersion of survival suits when project work involves cold water operations.
- 4.6.6 Water and ambient air temperatures shall be directly measured at the start of each work shift, and no less than once daily. Shift/daily temperature records will be maintained in the site or field notes.
- 4.7 Working on Ice
 - 4.7.1 Working in situations where ice exists shall be strictly limited due to the extreme hazards associated with falling through the ice cap, cold water immersion, and the logistical difficulties associated with executing a rescue.
 - 4.7.2 Specific information and procedures for working on ice can be found in *S3AM-315-ATT2 Ice Safe Work Practices*.
 - 4.7.3 Ice conditions (e.g., thickness, color, cracking) shall be recorded at the start of each work shift, and no less than once daily. Ice condition records will be maintained in the site or field notes. If ice conditions do not meet the criteria specified in *S3AM-315-ATT2 Ice Safe Work Practices*, then work shall not proceed until the required conditions are met.
 - 4.7.4 Personnel working in or on ice shall be attired in a USCG-approved Shallang / Mustang survival suit and be supported by shore side personnel to assist in recovery in the event of a break through. Depending on the nature of the project, on-ice personnel should either wear a harness tethered back to shore, or push a flat bottom boat along on the ice and have the boat tethered back to shore.
 - 4.7.5 Personnel working on ice covered waters should dramatically reduce vessel speed to avoid damaging propellers, shafts, and rudders. Personnel should be cognizant of shoreline ice which can prevent access to alternative ramps and docks that were considered as egress points in emergency planning.
 - 4.7.6 Personnel should be wary that boat ramps on tidally influenced waters can flash freeze at low tide, precluding or compromising safe access and egress.
 - 4.7.7 Extra safety equipment:
 - Extra blankets should be kept on site (in a vehicle) when working on or near frozen water bodies.
 - An ice pick, ice chisel, and/or ice auger should be used by a member of the crew with experience or training in identifying thin or weak ice.
 - A braided rope, preferably 98 feet (30 meters) in length.
- 4.8 Emergency Response

- 4.8.1 Emergency preparedness applies to any work where there exists the risk of falling into water, especially moving waters, along piers, bulkheads, and river banks with a sharp drop off in bathymetry.
 - 4.8.2 Field staff working in or alongside waters, especially moving waters, where there exists the possibility of falling in shall have an Emergency Response Plan to recover someone in the event they have fallen in.
 - 4.8.3 A throwable rescue device (Class IV PFD) shall be immediately available in the event of an emergency situation. In these situations the position and accessibility of throw rings and other rescue devices (e.g., ladders) and the mechanism to recover a person from the water shall be considered.
 - 4.8.4 The number and placement of ladders and throw rings shall be sufficient so that the maximum swimming distance to them is no more than 25 feet.
 - 4.8.5 If workers have the potential to get stuck in mud or fluidized sediment, air injection equipment designed to free worker's feet/legs may need to be available on site. At a minimum, a safety line should be available to be deployed from safe ground. If a worker does get stuck, they should not struggle as this causes further sinking. Use a pole to conduct sediment probing to assess water depths, the stability of shoreline terrain, and the bearing capacity of bottom sediments ahead of the chosen path.
- 4.9 Training
- All Staff and Managers working on projects with exposure to open water shall receive training in their applicable tasks, the hazards, precautions, and rescue procedures associated with working in or over water, refer to the *S3AM-003-PR1 SH&E Training* program.
 - All staff working on or near frozen water bodies shall complete Ice Safety Awareness training.
 - Staff who will be working on frozen water bodies regularly or for extended periods of time should take an Ice Rescue Training course, or obtain management approval based on their level of experience/competence working on ice.
 - Staff working near cold water shall complete awareness level training on Cold Water Immersion.

5.0 Records

- 5.1 None

6.0 Attachments

- 6.1 [S3AM-315-ATT1 Personal Floatation Devices](#)
- 6.2 [S3AM-315-ATT2 Ice Safe Work Practices](#)

Attachment C

Project and Activity Orientation Outline

AECOM will conduct a safety briefing for a person's initial visit to the study area. The briefing will be conducted:

- Prior to the start of work
- For any new AECOM or subconsultant personnel
- At each mobilization, or whenever there is a change in task or significant change in task location

All personnel working on the project who have received the briefing (including the HASP review) will sign the Personal Acknowledgement located at the end of the HASP. Visitors may receive a shortened version to address the hazards specific to their visit.

The following items, at minimum, will be discussed during the safety briefing:

- Contents of this HASP
- The Emergency Response Plan
- Contractor SH&E Management expectations
- Injury management, including notification and hospital and occupational clinic locations
- The AECOM 4-Sight program
- Stop Work authority
- The JSAs (Attachment E) for the tasks that will be performed on a given job
- Completion of a THA each day (Attachment E)
- Types of hazards at the study area and means for minimizing exposure to them
- Instructions for new operations to be conducted, and safe work practices
- PPE that must be used
- Lone worker check-in procedures
- Emergency evacuation routes, muster points, and tornado/storm shelters
- Location and use of emergency equipment

These meetings must be documented and maintained in the project files.

Attachment D

Project/Task-Specific Pre-Job Hazard Assessments or Job Safety Analysis

Americas

Pre-Job Hazard Assessment

S3AM-209-FM4

Location: Fish Tissue Sampling

Date: December 22, 2017

Prepared By: Linda Howard

Approved By: Jennifer Pretare

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
List principal activities involved in the scope of work	Identify each safety or health hazard		Identify engineering and administrative controls and any specific Personal Protective Equipment (PPE) that is required	
ACTIVITY 1 – Mobilize personnel and equipment to study area.	Traffic/driving hazards	10	<ul style="list-style-type: none"> All drivers must have current, valid driver's license on their person. Complete pre-use visual inspection. Walk around the vehicle to inspect for potential hazards or mechanical issues before driving. Practice defensive driving and drive in a courteous manner. All drivers must have taken the AECOM defensive driving course. Seat belts must be worn by the driver and all passengers. Obey all speed limits. Drivers must not use cellular telephones or other communication devices such as two-way radios unless safely parked. Window surfaces must be cleared of any materials such as ice, frost, mud, or water that can impair visibility. Travel with headlights on at all times. Travel during daylight hours when possible. Equip vehicles with: first aid kit, fire extinguisher, flares or triangle, spare tire and jack, cell phone. Limit activities to no more than 10-hour days. Implement fatigue management plan for >12 hour days. 	5
	Parking hazards	10	Park in a clear location, and back in to parking location to avoid backing out upon departure.	3
	Lifting hazards/muscle strain	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			<ul style="list-style-type: none"> Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	
ACTIVITY 2 – Hold Tailgate Safety Briefings and perform daily Task Hazard Analysis; review applicable Safety, Health, and Environment (SH&E) Procedures; inspect and don PPE; inspect tools and equipment.	Incorrect PPE usage	10	Safety Officer should check that required PPE is being used.	1
	Equipment malfunction	10	User (AECOM and/or Subcontractor Personnel) should inspect equipment before use.	1
	Lack of knowledge of tasks being performed	10	Discuss tasks to be performed by personnel, potential hazards, and control measures.	1
	Potential incidents and emergencies	10	<ul style="list-style-type: none"> Follow daily safety briefing, have personnel sign attendance form, which will be maintained onsite. Inform workers of emergency contact information, emergency procedures, and hospital route. 	1
	Severe weather	10	Include discussion of severe weather hazards in daily safety briefing and monitor throughout the duration of the task. Implement severe weather procedures as applicable.	5
	Potential contaminant exposure	10	Inform workers of potential for contaminant exposure and implement contaminant exposure avoidance procedures outlined in HASP, as applicable.	3
ACTIVITY 3 – Evaluate area for hazards (this should be performed regularly throughout the duration of the task).	Slips, trips, and falls	8	Personnel should identify and take measurable cautionary steps to observe areas for hazards: ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices.	4
	Heat stress/cold stress	10	<ul style="list-style-type: none"> Begin heat stress/cold stress monitoring as applicable and continue throughout duration of task. Implement heat stress/cold stress prevention procedures, as applicable. Heat stress: drink plenty of fluids and use appropriate work/rest schedule. Cold stress: dress in appropriate cold-weather clothing and bring change of dry clothing stored in waterproof bag. 	3
	Water hazards	10	<ul style="list-style-type: none"> Follow all appropriate water safety rules and regulations. Use appropriate PPE. 	5
	Severe weather	10	Assess severe weather hazards and implement	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			appropriate severe weather procedures.	
	Potential contaminant exposure	10	Maintain awareness of potential contaminant exposure and implement contaminant avoidance procedures.	3
ACTIVITY 4 – Load personnel and equipment onto vessel.	Lifting hazards/muscle strain/ergonomic hazard	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. Transfer equipment to people on boat rather than carrying equipment onto boat. 	3
	Vessel boarding hazards	10	<ul style="list-style-type: none"> Receive vessel operator's training prior to boarding vessel. Follow vessel operator's instructions for boarding vessel. Wear appropriate PPE, including correct type of Personal Flotation Device (PFD). Maintain three points of contact when boarding vessel. Follow vessel operator's instructions for loading equipment onto vessel. 	4
	Pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never position a hand where it can be pinched if a wheel rotates, a load releases, or a tool slips.	4
	Slips, trips, and falls	8	<ul style="list-style-type: none"> Wear appropriate footwear with non-slip soles. Ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices. Maintain three points of contact when boarding vessel. 	4
ACTIVITY 5 – Work aboard a research vessel on water.	Slips, trips, and falls	8	<ul style="list-style-type: none"> Wear appropriate footwear with non-slip soles. Ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices. Maintain three points of contact at all times. 	4
	Lines under tension/line of fire	10	Avoid keeping lines/ropes/cables under tension. Keep as much distance as possible between you and any source of potential energy release.	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
	Moving parts/pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never position a hand where it can be pinched if a wheel rotates, a load releases, or a tool slips.	4
	Water hazards	10	<ul style="list-style-type: none"> Adhere to all federal, state, and local boating and licensing laws. Work must be performed in accordance with the "Buddy System" Regulations. US Coast Guard (USCG)-approved PFD, sized and adjusted to the wearer, shall be worn by all workers when aboard the research vessel. Vessel operator will provide a SH&E Orientation on boating operations prior to departing dock, which will cover the following: man overboard, power loss/disabled boat, fire onboard, medical emergency. Vessel operator will submit a float plan to the Project Manager and follow the float plan and communication plan identified in the float plan. Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Ensure vessel has secondary means of propulsion such as oars or paddles. Workers are to remain seated when vessel is in motion. Avoid standing in vessel whenever possible. 	4
	Man overboard (MOB)/incapacitated person	10	<p>Vessel operator will review USCG MOB procedures:</p> <ul style="list-style-type: none"> No low visibility/night operations will occur. When deploying equipment, do not lean over the boat. When boat is underway, all people must remain in the cabin seated or standing maintaining four points of contact; no work on deck may occur. All staff aboard vessel will be trained in MOB recovery training. Perform safety briefing prior to departure and discuss MOB recovery procedure. Wear Type I, II, or III PFD AT ALL TIMES on board a boat or on dock. Person who observes person fall overboard must keep their eyes on him/her. Immediately cease work operations and commence a rescue procedure. Bring the vessel to the position of the person in the water (as opposed to having the person swim to the boat). 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			<ul style="list-style-type: none"> Immediately mark MOB location on GPS by "one-button MOB press." Throw a MOB pole marker/raise a MOB flag into the water to denote the location of the person overboard and to alert other boat traffic. Throw PFDs or other floatable items into the water to assist the person overboard. Send a distress call on Channel 16 if person is unresponsive or severely injured. 	
	Boat in danger of sinking	10	<p>Vessel operator will be responsible; however, if the vessel crew is incapacitated the following procedure shall be followed:</p> <ul style="list-style-type: none"> Send a distress call: PAN call over VHF Channel 16 if boat is not in imminent danger. Send a distress call: MAYDAY call over VHF Channel 16 if boat is in imminent danger. Turn on the bilge pump to begin pumping water to outside of boat. Assemble the emergency pump and begin pumping water. 	4
	Vessel fire	10	<p>Review fire extinguisher location and quantity and confirm fire extinguishers are charged prior to leaving dock</p> <p>Remember P.A.S.S:</p> <ul style="list-style-type: none"> Pull the Pin Aim the fire extinguisher at the base of the fire Squeeze the handle Sweep the base of fire side to side <p>Hail for help. See Distress Call Form MAYDAY (life/death) or PAN (assistance required, not life and death).</p> <p>Inflate life raft/abandon ship if necessary (e.g., risk of explosion).</p>	5
	Medical emergency	8	<ul style="list-style-type: none"> Review first aid kit location and contents prior to departure. AED shall be rented for the work. If a severe injury occurs, initiate a MAYDAY call. Contact the AECOM Incident Reporting line after the emergency has been addressed. 	4
	Heat stress/cold stress	10	<ul style="list-style-type: none"> Begin heat stress/cold stress monitoring as applicable and continue throughout duration of task. Implement heat stress/cold stress prevention procedures, as applicable. 	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			<ul style="list-style-type: none"> Heat stress: drink plenty of fluids and use appropriate work/rest schedule. Cold stress: dress in appropriate cold-weather clothing and bring change of dry clothing stored in waterproof bag. 	
	Severe weather hazards	10	Include discussion of severe weather hazards in daily safety briefing and monitor throughout the duration of the task. Implement severe weather procedures as applicable. Stop work during severe weather.	4
	Other commercial/recreational vessel traffic hazards	10	Adhere to all federal, state, and local boating and licensing laws.	5
ACTIVITY 6 – Samples to be caught by cast and reel practices initially.	Hand injuries (baiting hooks)	6	Employees should work only with tools with which they are appropriately trained and familiar and should receive specific instruction on use and operation of unfamiliar tools.	2
	Casting hazards	6	Be aware of surroundings. Communicate to other crew members and ensure everyone is safely out of the way when casting. All members near or engaged in fishing activities shall wear safety glasses at all times.	2
	Man overboard	10	<ul style="list-style-type: none"> MOB procedures should be reviewed with the team every time the vessel is underway. The captain of the vessel is responsible for relating these procedures. Verify that cast and reel operators are qualified and working in a safe manner. Use appropriate PPE, including PFD. 	4
ACTIVITY 7 – Electrofishing to be used if sample numbers caught by cast and reel are low. Includes generator use, suspending electrofishing unit off bow of fishing vessel, and two netters on the bow of the boat netting any fish, bringing them out of the water, and placing in cooler with river water.	Exposure to electrical shock: <ul style="list-style-type: none"> The electrical energy used in electrofishing is sufficient to cause death by electrocution. b) Adverse weather can affect electrofishing operations. c) Avoid electrofishing operations near bystanders, pets, or livestock that are in or near the water (within 100 feet of the electrofishing operation). 	10	<ul style="list-style-type: none"> Only staff that has been properly trained and certified in electrofishing protocols and equipment use may operate electrofishing equipment. Daily inspection of the electrofishing unit and all components should be conducted prior to field work to ensure everything is in working order. Record any maintenance work in a logbook. Equipment shall be maintained and inspected for safe condition. All external wiring, cables, and connections shall be inspected for physical damage before each use. Any equipment deficiency that may present a safety hazard shall be corrected before each field operation or when damage occurs during use. PPE, including waders and gloves, should be inspected for leaks. Leaking gear should be immediately repaired or replaced. Only footwear suitable for electrofishing should be used. All 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			<p>crewmembers need to wear footwear suitable to insulate them from electrical shock.</p> <ul style="list-style-type: none"> Suitable waders are generally constructed of neoprene, PVC, silicon, etc. In the event that Gore-Tex-type waders are used for electrofishing activities, the following precautions will be followed: operators need to wear dry clothing that covers bare skin within the wader. All footwear should be equipped with non-slip soles. Communicate during sampling. Discuss potential wading hazards, location of electrodes, and positioning of team members within the stream. Field crew should review fish exclusion/handling roles and coordinate field communication protocols. No electrofishing is to take place during rain or snow. Never touch the water while electrodes are on. Conduct a careful visual survey of sample area prior to surveying. Clearly communicate site-specific strategies with all crew members before sampling. Cease operation of the unit immediately if a crew member falls and/or makes contact with water. Remove electrodes from water until fallen crew member has been removed from the water or is no longer making contact with the water. Crew member should not wear conductive clothing such as watchbands, bracelets, rings, key chains, necklaces, etc. Do not attempt to start unit while the battery cover is removed. Persons with heart conditions should not be a part of an electrofishing crew. At least two members of the crew should be CPR trained. 	
	Person overboard	10	<ul style="list-style-type: none"> MOB procedures should be reviewed with the team every time the vessel is underway. The captain of the vessel is responsible for relating these procedures. Verify that electrofishing crew are qualified and working in a safe manner. Use appropriate PPE, including PFD. 	3
ACTIVITY 8 – Transfer samples into cooler, measure/weigh samples, select target species, double bag, label, wrap target species in tin foil, and discharge other fish.	Lifting hazards/muscle strain	6	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			before lifting or test them carefully.	
	Potential contaminant exposure	1	<ul style="list-style-type: none"> • Use proper tools for decontamination. • Wear appropriate PPE. • Place spent decontamination water in appropriate containers or jugs or discharge to site water as appropriate. 	1
ACTIVITY 9 – Decontaminate all gear in-between different fishing stations.	Lifting hazards/muscle strain	6	<ul style="list-style-type: none"> • Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. • Wear abrasion gloves when moving equipment. • No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3
	Potential contaminant exposure	1	<ul style="list-style-type: none"> • Use proper tools for decontamination. • Wear appropriate PPE. • Place spent decontamination water in appropriate containers or jugs or discharge to site water as appropriate. 	1
ACTIVITY 10 – Transfer samples from fishing vessel to another storage vessel bringing them to shore and maximizing storage in fishing vessel.	Lifting hazards/muscle strain	6	<ul style="list-style-type: none"> • Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. • Wear abrasion gloves when moving equipment. • No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3
	Person overboard	10	<ul style="list-style-type: none"> • MOB procedures should be reviewed with the team every time the vessel is underway. The captain of the vessel is responsible for relating these procedures. • Transfer samples to people on other vessel rather than carrying equipment onto other vessel. 	3
ACTIVITY 11 – Move fish samples off vessel by hand once docked.	Lifting hazards/muscle strain	6	<ul style="list-style-type: none"> • Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. • Wear abrasion gloves when moving equipment. • No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3
	Potential contaminant exposure	1	<ul style="list-style-type: none"> • Maintain awareness of potential contaminant exposure and implement avoidance procedures. • Use appropriate PPE, including nitrile gloves. 	1

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
ACTIVITY 12 – Load/transport fish samples to warehouse for processing.	Lifting hazards/muscle strain	6	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3
	Driving hazards	10	<ul style="list-style-type: none"> All drivers must have current, valid driver's license on their person. Complete pre-use visual inspection. Walk around the vehicle to inspect for potential hazards or mechanical issues before driving. Practice defensive driving and drive in a courteous manner. All drivers must have taken the AECOM defensive driving course. Seat belts must be worn by the driver and all passengers. Drivers must not use cellular telephones or other communication devices such as two-way radios unless safely parked. Window surfaces must be cleared of any materials such as ice, frost, mud, or water that can impair visibility. Equip vehicles with first aid kit, fire extinguisher, flares or triangle, spare tire and jack, and cell phone. Ensure all loads are properly secured. 	5
ACTIVITY 13 – Ship fish samples to lab for processing.	Lifting hazards/muscle strain	6	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3

SPECIAL REQUIREMENTS

Step #	Equipment to be Used	Inspection Requirements	Training Requirements
	List equipment to be used in work activity	List inspection/permit requirements for work activity	List training requirements including hazard communication
1.	Research vessel	Perform boat inspection prior to use. Complete and submit float plan prior to use.	USCG-licensed vessel operator or equivalent. MOB recovery with limited assistance. First Aid/CPR Training. Approved boating safety course.
2.	Rod and reel	Inspect prior to use. Do not use any tool that is defective or has missing parts.	Employees operating equipment shall be experienced or trained in the specific use of the equipment for the purpose of the sampling effort.
3.	Electrofishing units	Daily inspection of the electrofishing unit and all components should be conducted prior to field work to ensure everything is in working order. Record any maintenance work in a logbook. Equipment shall be maintained and inspected for safe condition. All external wiring, cables, and connections shall be inspected for physical damage before each use. Any equipment deficiency that may present a safety hazard shall be corrected before each field operation or when damage occurs during use.	Electrofishing crew must be properly trained and certified in electrofishing protocols and equipment.
4.	Emergency equipment provided by vessel operator (Gravity): <ul style="list-style-type: none"> • GPS • Satellite phone (if cell phone service does not cover entire survey area) • VHF radios will remain on Channel 16 (for hailing/distress calls) at all times to listen for boat traffic, alerts, etc. unless actively keying/communicating on another channel with another party • Rescue rope in throw bag (commercially available) • Air horns and/or whistles • Waterproof flashlight • *Secondary "kicker" motor and *alternate means of propulsion (oars or paddles) • *Bailer (if bilge pump is not provided, bucket, or similar device should be on board) • *Duct tape • *Length of rope for securing boat on shore or alongside larger vessel • *Functional bilge pump/emergency pump 	Inspect all equipment for battery life and integrity during the pre-trip boat inspection.	Personnel should be familiar with all emergency equipment.

	<ul style="list-style-type: none"> • *Anchor with five to seven times as much line as the depth of water plus the distance from the surface of the water to where the anchor will attach to the bow • *Type 4 throwable ring or cushion • *Type BC fire extinguisher (10 pound) if extra fuel is carried in portable containers. <p>* Required minimum equipment to be provided by vessel provider (chartered boat); project Field Coordinator to ensure remaining equipment is carried on board.</p>		
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INSTRUCTIONS AND RISK MATRIX

Hazard Evaluation – Identify principal steps of the task. Identify potential safety/health hazards for each step and determine initial risk rating using the matrix provided below. Identify control measures including PPE for each hazard. Re-evaluate hazard potential and assign a final risk rating. If the final risk rating is a 5-9 (medium risk) or 10-25 (high risk), additional hazard controls shall be identified and applied until the final risk rating is reduced to 4 or below. The final risk rating cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin. Add additional rows as required to cover all major steps/aspects of the activity.

Special Requirements – Identify equipment to be used including specific PPE required. Identify inspection requirements such as competent person, permit issue, documented task hazard analysis, etc. Identify training requirements such as hazard communication, scaffold user, fall protection, etc.

		High ←————→ Low				
Probability		Severity				
		5 - Catastrophic	4 - Critical	3 - Major	2 - Moderate	1 - Minor
High ↑ ↓ Low	5 - Frequent	25	20	15	10	5
	4 - Probable	20	16	12	8	4
	3 - Occasional	15	12	9	6	3
	2 - Remote	10	8	6	4	2
	1 - Improbable	5	4	3	2	1
10-25 (red) are high risk, 5-9 (yellow) are medium risk, and 1-4 (green) are low risk						

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>\$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>\$250K to \$1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> \$10K to \$250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> \$1K to \$10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</\$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur during task/activity	1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000

Risk Rating (Probability x Severity)	Risk Acceptance Authority
1 to 4 (Low)	Risk is tolerable, manage at local level
5 to 9 (Medium)	Risk requires approval by Operations Lead/Supervisor & SH&E Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & SH&E Director

Americas

Pre-Job Hazard Assessment

S3AM-209-FM4

Location: Portland Harbor (Fish Acoustic Tracking Study)

Date: January 10, 2018

Prepared By: Linda Howard

Approved By: Jennifer Pretare

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
List principal activities involved in the scope of work	Identify each safety or health hazard		Identify engineering and administrative controls and any specific Personal Protective Equipment (PPE) that is required	
ACTIVITY 1 – Mobilize equipment and personnel to study area.	Traffic/driving hazards	10	<ul style="list-style-type: none"> All drivers must have current, valid driver's license on their person. Complete pre-use visual inspection. Walk around the vehicle to inspect for potential hazards or mechanical issues before driving. Practice defensive driving and drive in a courteous manner. All drivers must have taken the AECOM defensive driving course. Seat belts must be worn by the driver and all passengers. Obey all speed limits. Drivers must not use cellular telephones or other communication devices such as two-way radios unless safely parked. Window surfaces must be cleared of any materials such as ice, frost, mud, or water that can impair visibility. Travel with headlights on at all times. Travel during daylight hours when possible. Equip vehicles with first aid kit, fire extinguisher, flares or triangle, spare tire and jack, cell phone. Limit activities to no more than 10-hour days. Implement fatigue management plan for >12 hour days. 	5
	Parking hazards	10	Park in a clear location, and back in to parking location to avoid backing out upon departure.	3
	Lifting hazards/muscle strain	6	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			<ul style="list-style-type: none"> No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	
ACTIVITY 2 – Hold Tailgate Safety Briefings and perform daily Task Hazard Analysis; review applicable Safety, Health, and Environment (SH&E) Procedures; inspect and don PPE; inspect tools and equipment.	Incorrect PPE usage	10	Safety Officer should check that required PPE is being used.	1
	Equipment malfunction	10	User (AECOM and/or Subcontractor Personnel) should inspect equipment before use.	1
	Lack of knowledge of tasks being performed	10	Discuss tasks to be performed by personnel, potential hazards, and control measures.	1
	Potential incidents and emergencies	10	<ul style="list-style-type: none"> Follow daily safety briefing, have personnel sign attendance form, which will be maintained on-site. Inform workers of emergency contact information, emergency procedures, and hospital route. 	1
	Severe weather	10	Include discussion of severe weather hazards in daily safety briefing and monitor throughout the duration of the task. Implement severe weather procedures as applicable.	5
	Potential contaminant exposure	10	Inform workers of potential for contaminant exposure and implement contaminant exposure avoidance procedures outlined in HASP, as applicable.	3
ACTIVITY 3 – Evaluate area for hazards (this should be performed regularly throughout the duration of the task).	Slips, trips, and falls	8	Personnel should identify and take measurable cautionary steps to observe areas for hazards: ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices.	4
	Heat stress/cold stress	10	<ul style="list-style-type: none"> Begin heat stress/cold stress monitoring as applicable and continue throughout duration of task. Implement heat stress/cold stress prevention procedures, as applicable. Heat stress: drink plenty of fluids and use appropriate work/rest schedule. Cold stress: dress in appropriate cold-weather clothing and bring change of dry clothing stored in waterproof bag. 	3
	Water hazards	10	<ul style="list-style-type: none"> Follow all appropriate water safety rules and regulations. Use appropriate PPE. 	5
	Severe weather	10	Assess severe weather hazards and implement appropriate severe weather procedures.	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
	Potential contaminant exposure	10	Maintain awareness of potential contaminant exposure and implement contaminant avoidance procedures.	3
ACTIVITY 4 – Load personnel and equipment onto vessel.	Lifting hazards/muscle strain/ergonomic hazards	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. Transfer equipment to people on boat rather than carrying equipment onto boat. 	3
	Vessel boarding hazards	10	<ul style="list-style-type: none"> Receive vessel operator's training prior to boarding vessel. Follow vessel operator's instructions for boarding vessel. Wear appropriate PPE, including correct type of Personal Flotation Device (PFD). Maintain three points of contact when boarding vessel. Follow vessel operator's instructions for loading equipment onto vessel. 	4
	Pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never position a hand where it can be pinched if a wheel rotates, a load releases, or a tool slips.	4
	Slips, trips, and falls	8	<ul style="list-style-type: none"> Wear appropriate footwear with non-slip soles. Ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices. Maintain three points of contact when boarding vessel. 	4
ACTIVITY 5 – Work aboard a research vessel on water.	Slips, trips, and falls	8	<ul style="list-style-type: none"> Wear appropriate footwear with non-slip soles. Ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices. Maintain three points of contact at all times. 	4
	Lines under tension/line of fire	10	Avoid keeping lines/ropes/cables under tension. Keep as much distance as possible between you and any source of potential energy release.	4
	Moving parts/pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			position a hand where it can be pinched if a wheel rotates, a load releases, or a tool slips.	
	Water hazards	10	<ul style="list-style-type: none"> Adhere to all federal, state, and local boating and licensing laws. Work must be performed in accordance with the "Buddy System" Regulations. US Coast Guard (USCG)-approved PFD, sized and adjusted to the wearer, shall be worn by all workers when aboard the research vessel. Vessel operator will provide a SH&E Orientation on boating operations prior to departing dock, which will cover the following: man overboard, power loss/disabled boat, fire onboard, medical emergency. Vessel operator will submit a float plan to the Project Manager and follow the float plan and communication plan identified in the float plan. Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Ensure vessel has secondary means of propulsion such as oars or paddles. Workers are to remain seated when vessel is in motion. Avoid standing in vessel whenever possible. 	4
	Man overboard (MOB)/incapacitated person	10	<p>Vessel operator will review USCG MOB procedures:</p> <ul style="list-style-type: none"> No low visibility/night operations will occur. When deploying equipment, do not lean over the boat. When boat is underway, all people must remain in the cabin seated or standing maintaining four points of contact; no work on deck may occur. All staff aboard vessel will be trained in MOB recovery training. Perform safety briefing prior to departure and discuss MOB recovery procedure. Wear Type I, II, or III PFD AT ALL TIMES on board a boat or on dock. Person who observes person fall overboard must keep their eyes on him/her. Immediately cease work operations and commence a rescue procedure. Bring the vessel to the position of the person in the water (as opposed to having the person swim to the boat). Immediately mark MOB location on GPS by "one-button MOB press." Throw a MOB pole marker/raise a MOB flag into the 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			water to denote the location of the person overboard and to alert other boat traffic. <ul style="list-style-type: none"> • Throw PFDs or other floatable items into the water to assist the person overboard. • Send a distress call on Channel 16 if person is un-responsive or severely injured. 	
	Boat in danger of sinking	10	Vessel operator will be responsible; however, if the vessel crew is incapacitated, the following procedure shall be followed: <ul style="list-style-type: none"> • Send a distress call: PAN call over VHF Channel 16 if boat is not in imminent danger. • Send a distress call: MAYDAY call over VHF Channel 16 if boat is in imminent danger. • Turn on the bilge pump to begin pumping water to outside of boat. • Assemble the emergency pump and begin pumping water. 	4
	Vessel fire	10	Review fire extinguisher location and quantity and confirm fire extinguishers are charged prior to leaving dock. Remember P.A.S.S.: <ul style="list-style-type: none"> • Pull the Pin • Aim the fire extinguisher at the base of the fire • Squeeze the handle • Sweep the base of fire side to side Hail for help. See Distress Call Form MAYDAY (life/death) or PAN (assistance required, not life and death). Inflate life raft/abandon ship if necessary (e.g., risk of explosion).	5
	Medical emergency	8	<ul style="list-style-type: none"> • Review first aid kit location and contents prior to departure. • AED shall be rented for the work. • If a severe injury occurs, initiate a MAYDAY call. • Contact the AECOM Incident Reporting line after the emergency has been addressed. 	4
	Heat stress/cold stress	10	<ul style="list-style-type: none"> • Begin heat stress/cold stress monitoring as applicable and continue throughout duration of task. • Implement heat stress/cold stress prevention procedures, as applicable. • Heat stress: drink plenty of fluids and use appropriate work/rest schedule. • Cold stress: dress in appropriate cold-weather clothing 	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			and bring change of dry clothing stored in waterproof bag.	
	Severe weather hazards	10	Include discussion of severe weather hazards in daily safety briefing and monitor throughout the duration of the task. Implement severe weather procedures as applicable. Stop work during severe weather.	4
	Other commercial/recreational vessel traffic hazards	10	Adhere to all federal, state, and local boating and licensing laws.	5
ACTIVITY 6 – Perform fish collection using rod and reel/hook and line.	Hand injuries (baiting hooks)	6	<ul style="list-style-type: none"> Employees should work only with tools with which they are appropriately trained and familiar and should receive specific instruction on use and operation of unfamiliar tools. 	2
	Casting hazards	6	<ul style="list-style-type: none"> Be aware of surroundings. Communicate to other crew members and ensure everyone is safely out of the way when casting. All members near or engaged in fishing activities shall wear safety glasses at all times. 	2
	Man overboard	10	<ul style="list-style-type: none"> MOB procedures should be reviewed with the team every time the vessel is underway. The captain of the vessel is responsible for relating these procedures. Verify that cast and reel operators are qualified and working in a safe manner. Use appropriate PPE, including PFD. 	3
ACTIVITY 7 – Deploy monitoring equipment using a davit.	Man overboard	10	<ul style="list-style-type: none"> The flow or current of the waterway must be investigated prior to work being initiated. Equipment will not be deployed overboard when a ship wake or heavy vessel traffic is nearby. The employee must be equipped with a life vest; the life vest must be rated for the employee's weight. Practice good housekeeping to keep the ground around the work area clear of obstructions, equipment, and other tripping hazards. The field crew must be comprised of a minimum of two individuals; one will assist the equipment vendor and the attendee will watch for the safety of the working team members. If one individual must lean outside of the boat confines to perform a task, a lifeline must be attached to the individual. If the individual falls out of the boat, the lifeline will permit the individual from floating away from the immediate work area and permit a less hazardous rescue. 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
	Struck by/crush hazard	10	<ul style="list-style-type: none"> Note: A first aid kit must be made readily available. All lifting equipment (e.g., davit) must be inspected prior to use and rated for the anticipated load. Always ascertain that the area over which the load will travel is free and clear of personnel or other potential obstacles. Appropriate rigging of the load will be evaluated prior to any lift. The lifting/lowering of any equipment must be done in a controlled manner (using a qualified operator, a "test lift," and a safety "tag line," etc.). Hard hats are required during lifting operations. Personnel are not permitted to stand beneath a suspended load. Once the load is lifted, it will be swung over the boat's gunwale/ stern lowered into place. The tag line will be disconnected and davit hook released/recovered. 	5
ACTIVITY 8 – Recover monitoring equipment using a davit.	Man overboard	6	See Activity 7 above.	3
	Struck by/crush hazard	10	See Activity 7 above.	5
ACTIVITY 9 – Decontaminate equipment.	Lifting hazards/muscle strain	6	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3
	Potential contaminant exposure	1	<ul style="list-style-type: none"> Use proper tools for decontamination. Wear appropriate PPE. Place spent decontamination water in appropriate containers for on-shore disposal or discharge to site water as appropriate. 	1
ACTIVITY 10 – Disembark vessel once docked.	Lifting hazards/muscle strain	6	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3
	Vessel offloading hazards	10	<ul style="list-style-type: none"> Follow vessel operator's instructions for leaving vessel. Maintain three points of contact when leaving vessel. Follow vessel operator's instructions for transferring 	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			equipment and samples off vessel.	
	Ergonomic hazards	9	Follow proper ergonomic practices.	3

SPECIAL REQUIREMENTS

Step #	Equipment to be Used	Inspection Requirements	Training Requirements
	List equipment to be used in work activity	List inspection/permit requirements for work activity	List training requirements including hazard communication
1.	Research vessel	Perform boat inspection prior to use. Complete and submit float plan prior to use.	USCG-licensed vessel operator or equivalent. MOB recovery with limited assistance. First Aid/CPR Training. Approved boating safety course.
2.	Acoustic monitoring equipment	Daily inspection before use.	Employees operating equipment shall be experienced or trained in the specific use of the equipment for the purpose of the sampling effort.
3.	<p>Emergency equipment provided by vessel operator (Ballard Marine):</p> <ul style="list-style-type: none"> • GPS • Satellite phone (if cell phone service does not cover entire survey area) • VHF radios will remain on Channel 16 (for hailing/distress calls) at all times to listen for boat traffic, alerts, etc. unless actively keying/communicating on another channel with another party • Rescue rope in throw bag (commercially available) • Air horns and/or whistles • Waterproof flashlight • *Secondary "kicker" motor and *alternate means of propulsion (oars or paddles) • *Bailer (if bilge pump is not provided, bucket, or similar device should be on board) • *Duct tape • *Length of rope for securing boat on shore or alongside larger vessel • *Functional bilge pump/emergency pump • *Anchor with five to seven times as much line as the depth of water plus the distance from the surface of the water to where the anchor will attach to the bow • *Type 4 throwable ring or cushion • *Type BC fire extinguisher (10 pound) if extra fuel is carried in portable containers. <p>* Required minimum equipment to be provided by vessel provider (chartered boat); project Field Coordinator to ensure remaining equipment is carried on board.</p>	Inspect all equipment for battery life and integrity during the pre-trip boat inspection.	Personnel should be familiar with all emergency equipment.

INSTRUCTIONS AND RISK MATRIX

Hazard Evaluation – Identify principal steps of the task. Identify potential safety/health hazards for each step and determine initial risk rating using the matrix provided below. Identify control measures including PPE for each hazard. Re-evaluate hazard potential and assign a final risk rating. If the final risk rating is a 5-9 (medium risk) or 10-25 (high risk), additional hazard controls shall be identified and applied until the final risk rating is reduced to 4 or below. The final risk rating cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin. Add additional rows as required to cover all major steps/aspects of the activity.

Special Requirements – Identify equipment to be used including specific PPE required. Identify inspection requirements such as competent person, permit issue, documented task hazard analysis, etc. Identify training requirements such as hazard communication, scaffold user, fall protection, etc.

		High ← → Low				
High ↑ ↓ Low	Probability	Severity				
		5 - Catastrophic	4 - Critical	3 - Major	2 - Moderate	1 - Minor
	5 - Frequent	25	20	15	10	5
	4 - Probable	20	16	12	8	4
	3 - Occasional	15	12	9	6	3
	2 - Remote	10	8	6	4	2
	1 - Improbable	5	4	3	2	1
10-25 (red) are high risk, 5-9 (yellow) are medium risk, and 1-4 (green) are low risk						

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>\$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>\$250K to \$1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> \$10K to \$250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> \$1K to \$10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</\$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur during task/activity	1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000
Risk Rating (Probability x Severity)		Risk Acceptance Authority
1 to 4 (Low)		Risk is tolerable, manage at local level
5 to 9 (Medium)		Risk requires approval by Operations Lead/Supervisor & SH&E Manager
10 to 25 (High)		Risk requires the approval of the Operations Manager & SH&E Director

Americas

Pre-Job Hazard Assessment

S3AM-209-FM4

Location: Portland Harbor (Porewater Metals Sampling)

Date: January 10, 2018

Prepared By: Linda Howard

Approved By: Jennifer Pretare

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
List principal activities involved in the scope of work	Identify each safety or health hazard		Identify engineering and administrative controls and any specific Personal Protective Equipment (PPE) that is required	
ACTIVITY 1 – Mobilize equipment and personnel to study area.	Traffic/driving hazards	10	<ul style="list-style-type: none"> All drivers must have current, valid driver's license on their person. Complete pre-use visual inspection. Walk around the vehicle to inspect for potential hazards or mechanical issues before driving. Practice defensive driving and drive in a courteous manner. All drivers must have taken the AECOM defensive driving course. Seat belts must be worn by the driver and all passengers. Obey all speed limits. Drivers must not use cellular telephones or other communication devices such as two-way radios unless safely parked. Window surfaces must be cleared of any materials such as ice, frost, mud, or water that can impair visibility. Travel with headlights on at all times. Travel during daylight hours when possible. Equip vehicles with first aid kit, fire extinguisher, flares or triangle, spare tire and jack, cell phone. Limit activities to no more than 10-hour days. Implement fatigue management plan for >12 hour days. 	5
	Parking hazards	10	Park in a clear location, and back in to parking location to avoid backing out upon departure.	3
	Lifting hazards/muscle strain	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			<ul style="list-style-type: none"> No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	
ACTIVITY 2 – Hold Tailgate Safety Briefings and perform daily Task Hazard Analysis; review applicable Safety, Health, and Environment (SH&E) Procedures; inspect and don PPE; inspect tools and equipment.	Incorrect PPE usage	10	Safety Officer should check that required PPE is being used.	1
	Equipment malfunction	10	User (AECOM and/or Subcontractor Personnel) should inspect equipment before use.	1
	Lack of knowledge of tasks being performed	10	Discuss tasks to be performed by personnel, potential hazards, and control measures.	1
	Potential incidents and emergencies	10	<ul style="list-style-type: none"> Follow daily safety briefing, have personnel sign attendance form, which will be maintained on-site. Inform workers of emergency contact information, emergency procedures, and hospital route. 	1
	Severe weather	10	Include discussion of severe weather hazards in daily safety briefing and monitor throughout the duration of the task. Implement severe weather procedures as applicable.	5
	Potential contaminant exposure	10	Inform workers of potential for contaminant exposure and implement contaminant exposure avoidance procedures outlined in HASP, as applicable.	3
ACTIVITY 3 – Evaluate area for hazards (this should be performed regularly throughout the duration of the task).	Slips, trips, and falls	8	Personnel should identify and take measurable cautionary steps to observe areas for hazards: ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices.	4
	Heat stress/cold stress	10	<ul style="list-style-type: none"> Begin heat stress/cold stress monitoring as applicable and continue throughout duration of task. Implement heat stress/cold stress prevention procedures, as applicable. Heat stress: drink plenty of fluids and use appropriate work/rest schedule. Cold stress: dress in appropriate cold-weather clothing and bring change of dry clothing stored in waterproof bag. 	3
	Water hazards	10	<ul style="list-style-type: none"> Follow all appropriate water safety rules and regulations. Use appropriate PPE. 	5
	Severe weather	10	Assess severe weather hazards and implement appropriate severe weather procedures.	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
	Potential contaminant exposure	10	Maintain awareness of potential contaminant exposure and implement contaminant avoidance procedures.	3
ACTIVITY 4 – Load personnel and equipment onto vessel.	Lifting hazards/muscle strain/ergonomic hazards	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. Transfer equipment to people on boat rather than carrying equipment onto boat. 	3
	Vessel boarding hazards	10	<ul style="list-style-type: none"> Receive vessel operator's training prior to boarding vessel. Follow vessel operator's instructions for boarding vessel. Wear appropriate PPE, including correct type of Personal Flotation Device (PFD). Maintain three points of contact when boarding vessel. Follow vessel operator's instructions for loading equipment onto vessel. 	4
	Pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never position a hand where it can be pinched if a wheel rotates, a load releases, or a tool slips.	4
	Slips, trips, and falls	8	<ul style="list-style-type: none"> Wear appropriate footwear with non-slip soles. Ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices. Maintain three points of contact when boarding vessel. 	4
ACTIVITY 5 – Work aboard a research vessel on water.	Slips, trips, and falls	8	<ul style="list-style-type: none"> Wear appropriate footwear with non-slip soles. Ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices. Maintain three points of contact at all times. 	4
	Lines under tension/line of fire	10	Avoid keeping lines/ropes/cables under tension. Keep as much distance as possible between you and any source of potential energy release.	4
	Moving parts/pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			position a hand where it can be pinched if a wheel rotates, a load releases, or a tool slips.	
	Water hazards	10	<ul style="list-style-type: none"> Adhere to all federal, state, and local boating and licensing laws. Work must be performed in accordance with the "Buddy System" Regulations. US Coast Guard (USCG)-approved PFD, sized and adjusted to the wearer, shall be worn by all workers when aboard the research vessel. Vessel operator will provide a SH&E Orientation on boating operations prior to departing dock, which will cover the following: man overboard, power loss/disabled boat, fire onboard, medical emergency. Vessel operator will submit a float plan to the Project Manager and follow the float plan and communication plan identified in the float plan. Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Ensure vessel has secondary means of propulsion such as oars or paddles. Workers are to remain seated when vessel is in motion. Avoid standing in vessel whenever possible. 	4
	Man overboard (MOB)/incapacitated person	10	<p>Vessel operator will review USCG MOB procedures:</p> <ul style="list-style-type: none"> No low visibility/night operations will occur. When deploying equipment, do not lean over the boat. When boat is underway, all people must remain in the cabin seated or standing maintaining four points of contact; no work on deck may occur. All staff aboard vessel will be trained in MOB recovery training. Perform safety briefing prior to departure and discuss MOB recovery procedure. Wear Type I, II, or III PFD AT ALL TIMES on board a boat or on dock. Person who observes person fall overboard must keep their eyes on him/her. Immediately cease work operations and commence a rescue procedure. Bring the vessel to the position of the person in the water (as opposed to having the person swim to the boat). Immediately mark MOB location on GPS by "one-button MOB press." Throw a MOB pole marker/raise a MOB flag into the 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			water to denote the location of the person overboard and to alert other boat traffic. <ul style="list-style-type: none"> • Throw PFDs or other floatable items into the water to assist the person overboard. • Send a distress call on Channel 16 if person is un-responsive or severely injured. 	
	Boat in danger of sinking	10	Vessel operator will be responsible; however, if the vessel crew is incapacitated, the following procedure shall be followed: <ul style="list-style-type: none"> • Send a distress call: PAN call over VHF Channel 16 if boat is not in imminent danger. • Send a distress call: MAYDAY call over VHF Channel 16 if boat is in imminent danger. • Turn on the bilge pump to begin pumping water to outside of boat. • Assemble the emergency pump and begin pumping water. 	4
	Vessel fire	10	Review fire extinguisher location and quantity and confirm fire extinguishers are charged prior to leaving dock. Remember P.A.S.S.: <ul style="list-style-type: none"> • Pull the Pin • Aim the fire extinguisher at the base of the fire • Squeeze the handle • Sweep the base of fire side to side Hail for help. See Distress Call Form MAYDAY (life/death) or PAN (assistance required, not life and death). Inflate life raft/abandon ship if necessary (e.g., risk of explosion).	5
	Medical emergency	8	<ul style="list-style-type: none"> • Review first aid kit location and contents prior to departure. • AED shall be rented for the work. • If a severe injury occurs, initiate a MAYDAY call. • Contact the AECOM Incident Reporting line after the emergency has been addressed. 	4
	Heat stress/cold stress	10	<ul style="list-style-type: none"> • Begin heat stress/cold stress monitoring as applicable and continue throughout duration of task. • Implement heat stress/cold stress prevention procedures, as applicable. • Heat stress: drink plenty of fluids and use appropriate work/rest schedule. • Cold stress: dress in appropriate cold-weather clothing 	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			and bring change of dry clothing stored in waterproof bag.	
	Severe weather hazards	10	Include discussion of severe weather hazards in daily safety briefing and monitor throughout the duration of the task. Implement severe weather procedures as applicable. Stop work during severe weather.	4
	Other commercial/recreational vessel traffic hazards	10	Adhere to all federal, state, and local boating and licensing laws.	5
ACTIVITY 6 – Dialysis equilibrium passive water samplers (peepers), a glass or polyethylene vial covered with a polyethersulfone membrane, will be used to collect the porewater samples. Peeper sampler (peepers mounted into an all HDPE plastic 3-D printed frame) will be deployed from Gravity research vessel using a push pole deployment method, with a marker and retrieval line and secured to the sediment surface using sand-bag weights. Peeper samplers will be retrieved over a 2-week period.	Man overboard	10	<ul style="list-style-type: none"> Geosyntec staff will deploy and retrieve the peeper samplers. Geosyntec will prepare a job safety analysis identifying the specific steps, hazards, and control measures for deploying the equipment. MOB procedures should be reviewed with the team every time the vessel is underway. The captain of the vessel is responsible for relating these procedures. Verify that the operator of the lead line is qualified and working in a safe manner. Use appropriate PPE, including PFD. 	4
	Moving parts/pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never position a hand where it can be pinched if a wheel rotates, a load releases, or a tool slips.	4
ACTIVITY 7 – Decontaminate equipment.	Lifting hazards/muscle strain	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3
	Potential contaminant exposure	8	<ul style="list-style-type: none"> Use proper tools for decontamination. Wear nitrile gloves, and chemical goggles during the decontamination process Follow other Standard Operating Procedures (SOPs) for decontamination as specified in the Task Specific Field Sampling Plan. 	1
ACTIVITY 8 – Load/transport samples to on-shore facility for processing and shipping to lab.	Lifting hazards/muscle strain	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			<ul style="list-style-type: none"> No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	
	Driving hazards	10	<ul style="list-style-type: none"> All drivers must have current, valid driver's license on their person. Complete pre-use visual inspection. Walk around the vehicle to inspect for potential hazards or mechanical issues before driving. Practice defensive driving and drive in a courteous manner. All drivers must have taken the AECOM defensive driving course. Seat belts must be worn by the driver and all passengers. Drivers must not use cellular telephones or other communication devices such as two-way radios unless safely parked. Window surfaces must be cleared of any materials such as ice, frost, mud, or water that can impair visibility. Equip vehicles with first aid kit, fire extinguisher, flares or triangle, spare tire and jack, and cell phone. Ensure all loads are properly secured. 	5

SPECIAL REQUIREMENTS

Step #	Equipment to be Used	Inspection Requirements	Training Requirements
	List equipment to be used in work activity	List inspection/permit requirements for work activity	List training requirements including hazard communication
1.	Research vessel	Perform boat inspection prior to use. Complete and submit float plan prior to use.	USCG-licensed vessel operator or equivalent. MOB recovery with limited assistance. First Aid/CPR Training. Approved boating safety course.
2.	Peeper sampler and push pole deployment system	Daily inspection before use.	Employees operating equipment shall be experienced or trained in the specific use of the equipment for the purpose of the sampling effort. Geosyntec field staff will conduct peeper deployment and retrieval.
3.	Emergency equipment provided by vessel operator (Gravity): <ul style="list-style-type: none"> • GPS • Satellite phone (if cell phone service does not cover entire survey area) • VHF radios will remain on Channel 16 (for hailing/distress calls) at all times to listen for boat traffic, alerts, etc. unless actively keying/communicating on another channel with another party • Rescue rope in throw bag (commercially available) • Air horns and/or whistles • Waterproof flashlight • *Secondary "kicker" motor and *alternate means of propulsion (oars or paddles) • *Bailer (if bilge pump is not provided, bucket, or similar device should be on board) • *Duct tape • *Length of rope for securing boat on shore or alongside larger vessel • *Functional bilge pump/emergency pump • *Anchor with five to seven times as much line as the depth of water plus the distance from the surface of the water to where the anchor will attach to the bow • *Type 4 throwable ring or cushion • *Type BC fire extinguisher (10 pound) if extra fuel is carried in portable containers. <p>* Required minimum equipment to be provided by vessel provider (chartered boat); project Field Coordinator to ensure remaining equipment is carried on board.</p>	Inspect all equipment for battery life and integrity during the pre-trip boat inspection.	Personnel should be familiar with all emergency equipment.

INSTRUCTIONS AND RISK MATRIX

Hazard Evaluation – Identify principal steps of the task. Identify potential safety/health hazards for each step and determine initial risk rating using the matrix provided below. Identify control measures including PPE for each hazard. Re-evaluate hazard potential and assign a final risk rating. If the final risk rating is a 5-9 (medium risk) or 10-25 (high risk), additional hazard controls shall be identified and applied until the final risk rating is reduced to 4 or below. The final risk rating cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin. Add additional rows as required to cover all major steps/aspects of the activity.

Special Requirements – Identify equipment to be used including specific PPE required. Identify inspection requirements such as competent person, permit issue, documented task hazard analysis, etc. Identify training requirements such as hazard communication, scaffold user, fall protection, etc.

		High ←————→ Low				
Probability		Severity				
		5 - Catastrophic	4 - Critical	3 - Major	2 - Moderate	1 - Minor
High ↑ ↓ Low	5 - Frequent	25	20	15	10	5
	4 - Probable	20	16	12	8	4
	3 - Occasional	15	12	9	6	3
	2 - Remote	10	8	6	4	2
	1 - Improbable	5	4	3	2	1
10-25 (red) are high risk, 5-9 (yellow) are medium risk, and 1-4 (green) are low risk						

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>\$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>\$250K to \$1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> \$10K to \$250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> \$1K to \$10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</\$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur during task/activity	1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000
Risk Rating (Probability x Severity)		Risk Acceptance Authority
1 to 4 (Low)		Risk is tolerable, manage at local level
5 to 9 (Medium)		Risk requires approval by Operations Lead/Supervisor & SH&E Manager
10 to 25 (High)		Risk requires the approval of the Operations Manager & SH&E Director

Americas

Pre-Job Hazard Assessment

S3AM-209-FM4

Location: Portland Harbor (Sediment Traps)

Date: January 10, 2018

Prepared By: Linda Howard

Approved By: Jennifer Pretare

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
List principal activities involved in the scope of work	Identify each safety or health hazard		Identify engineering and administrative controls and any specific Personal Protective Equipment (PPE) that is required	
ACTIVITY 1 – Mobilize equipment and personnel to study area.	Traffic/driving hazards	10	<ul style="list-style-type: none"> All drivers must have current, valid driver's license on their person. Complete pre-use visual inspection. Walk around the vehicle to inspect for potential hazards or mechanical issues before driving. Practice defensive driving and drive in a courteous manner. All drivers must have taken the AECOM defensive driving course. Seat belts must be worn by the driver and all passengers. Obey all speed limits. Drivers must not use cellular telephones or other communication devices such as two-way radios unless safely parked. Window surfaces must be cleared of any materials such as ice, frost, mud, or water that can impair visibility. Travel with headlights on at all times. Travel during daylight hours when possible. Equip vehicles with first aid kit, fire extinguisher, flares or triangle, spare tire and jack, cell phone. Limit activities to no more than 10-hour days. Implement fatigue management plan for >12 hour days. 	5
	Parking hazards	10	Park in a clear location, and back in to parking location to avoid backing out upon departure.	3
	Lifting hazards/muscle strain	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			<ul style="list-style-type: none"> Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	
ACTIVITY 2 – Hold Tailgate Safety Briefings and perform daily Task Hazard Analysis; review applicable Safety, Health, and Environment (SH&E) Procedures; inspect and don PPE; inspect tools and equipment.	Incorrect PPE usage	10	Safety Officer should check that required PPE is being used.	1
	Equipment malfunction	10	User (AECOM and/or Subcontractor Personnel) should inspect equipment before use.	1
	Lack of knowledge of tasks being performed	10	Discuss tasks to be performed by personnel, potential hazards, and control measures.	1
	Potential incidents and emergencies	10	<ul style="list-style-type: none"> Follow daily safety briefing, have personnel sign attendance form, which will be maintained on-site. Inform workers of emergency contact information, emergency procedures, and hospital route. 	1
	Severe weather	10	Include discussion of severe weather hazards in daily safety briefing and monitor throughout the duration of the task. Implement severe weather procedures as applicable.	5
	Potential contaminant exposure	10	Inform workers of potential for contaminant exposure and implement contaminant exposure avoidance procedures outlined in HASP, as applicable.	3
ACTIVITY 3 – Evaluate area for hazards (this should be performed regularly throughout the duration of the task).	Slips, trips, and falls	8	Personnel should identify and take measurable cautionary steps to observe areas for hazards: ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices.	4
	Heat stress/cold stress	10	<ul style="list-style-type: none"> Begin heat stress/cold stress monitoring as applicable and continue throughout duration of task. Implement heat stress/cold stress prevention procedures, as applicable. Heat stress: drink plenty of fluids and use appropriate work/rest schedule. Cold stress: dress in appropriate cold-weather clothing and bring change of dry clothing stored in waterproof bag. 	3
	Water hazards	10	<ul style="list-style-type: none"> Follow all appropriate water safety rules and regulations. Use appropriate PPE. 	5
	Severe weather	10	Assess severe weather hazards and implement	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			appropriate severe weather procedures.	
	Potential contaminant exposure	10	Maintain awareness of potential contaminant exposure and implement contaminant avoidance procedures.	3
ACTIVITY 4 – Load personnel and equipment onto vessel.	Lifting hazards/muscle strain/ergonomic hazards	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. Transfer equipment to people on boat rather than carrying equipment onto boat. 	3
	Vessel boarding hazards	10	<ul style="list-style-type: none"> Receive vessel operator's training prior to boarding vessel. Follow vessel operator's instructions for boarding vessel. Wear appropriate PPE, including correct type of Personal Flotation Device (PFD). Maintain three points of contact when boarding vessel. Follow vessel operator's instructions for loading equipment onto vessel. 	4
	Pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never position a hand where it can be pinched if a wheel rotates, a load releases, or a tool slips.	4
	Slips, trips, and falls	8	<ul style="list-style-type: none"> Wear appropriate footwear with non-slip soles. Ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices. Maintain three points of contact when boarding vessel. 	4
ACTIVITY 5 – Work aboard a research vessel on water.	Slips, trips, and falls	8	<ul style="list-style-type: none"> Wear appropriate footwear with non-slip soles. Ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices. Maintain three points of contact at all times. 	4
	Lines under tension/line of fire	10	Avoid keeping lines/ropes/cables under tension. Keep as much distance as possible between you and any source of potential energy release.	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
	Moving parts/pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never position a hand where it can be pinched if a wheel rotates, a load releases, or a tool slips.	4
	Water hazards	10	<ul style="list-style-type: none"> Adhere to all federal, state, and local boating and licensing laws. Work must be performed in accordance with the "Buddy System" Regulations. US Coast Guard (USCG)-approved PFD, sized and adjusted to the wearer, shall be worn by all workers when aboard the research vessel. Vessel operator will provide a SH&E Orientation on boating operations prior to departing dock, which will cover the following: man overboard, power loss/disabled boat, fire onboard, medical emergency. Vessel operator will submit a float plan to the Project Manager and follow the float plan and communication plan identified in the float plan. Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Ensure vessel has secondary means of propulsion such as oars or paddles. Workers are to remain seated when vessel is in motion. Avoid standing in vessel whenever possible. 	4
	Man overboard (MOB)/incapacitated person	10	<p>Vessel operator will review USCG MOB procedures:</p> <ul style="list-style-type: none"> No low visibility/night operations will occur. When deploying equipment, do not lean over the boat. When boat is underway, all people must remain in the cabin seated or standing maintaining four points of contact; no work on deck may occur. All staff aboard vessel will be trained in MOB recovery training. Perform safety briefing prior to departure and discuss MOB recovery procedure. Wear Type I, II, or III PFD AT ALL TIMES on board a boat or on dock. Person who observes person fall overboard must keep their eyes on him/her. Immediately cease work operations and commence a rescue procedure. Bring the vessel to the position of the person in the water (as opposed to having the person swim to the boat). 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			<ul style="list-style-type: none"> Immediately mark MOB location on GPS by "one-button MOB press." Throw a MOB pole marker/raise a MOB flag into the water to denote the location of the person overboard and to alert other boat traffic. Throw PFDs or other floatable items into the water to assist the person overboard. Send a distress call on Channel 16 if person is unresponsive or severely injured. 	
	Boat in danger of sinking	10	<p>Vessel operator will be responsible; however, if the vessel crew is incapacitated, the following procedure shall be followed:</p> <ul style="list-style-type: none"> Send a distress call: PAN call over VHF Channel 16 if boat is not in imminent danger. Send a distress call: MAYDAY call over VHF Channel 16 if boat is in imminent danger. Turn on the bilge pump to begin pumping water to outside of boat. Assemble the emergency pump and begin pumping water. 	4
	Vessel fire	10	<p>Review fire extinguisher location and quantity and confirm fire extinguishers are charged prior to leaving dock. Remember P.A.S.S.:</p> <ul style="list-style-type: none"> Pull the Pin Aim the fire extinguisher at the base of the fire Squeeze the handle Sweep the base of fire side to side <p>Hail for help. See Distress Call Form MAYDAY (life/death) or PAN (assistance required, not life and death).</p> <p>Inflate life raft/abandon ship if necessary (e.g., risk of explosion).</p>	5
	Medical emergency	8	<ul style="list-style-type: none"> Review first aid kit location and contents prior to departure. AED shall be rented for the work. If a severe injury occurs, initiate a MAYDAY call. Contact the AECOM Incident Reporting line after the emergency has been addressed. 	4
	Heat stress/cold stress	10	<ul style="list-style-type: none"> Begin heat stress/cold stress monitoring as applicable and continue throughout duration of task. Implement heat stress/cold stress prevention 	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			procedures, as applicable. <ul style="list-style-type: none"> Heat stress: drink plenty of fluids and use appropriate work/rest schedule. Cold stress: dress in appropriate cold-weather clothing and bring change of dry clothing stored in waterproof bag. 	
	Severe weather hazards	10	Include discussion of severe weather hazards in daily safety briefing and monitor throughout the duration of the task. Implement severe weather procedures as applicable. Stop work during severe weather.	4
	Other commercial/recreational vessel traffic hazards	10	Adhere to all federal, state, and local boating and licensing laws.	5
ACTIVITY 6 – Deploy and retrieve sediment traps. Sediments traps consist of four glass cylinders placed in protective PVC sleeves, which commercial divers will mount vertically to rebar or pipe anchored to the river bottom. At retrieval, the divers will return to the traps, cap the glass cylinders, and transfer the cylinders to the vessel for processing. Once the processing is complete, the divers will return the glass cylinders to the PVC sleeves that remain fixed to the river bed. Sediment trap deployment and retrieval will be conducted from Gravity research vessels.	Scientific diving hazards (refer to Gravity and Global Diving Documentation for list of hazards)	10	<ul style="list-style-type: none"> Gravity and Global Diving will prepare the following information and documents for review by AECOM's Commercial Diving Safety Officer: List of Personnel: <ul style="list-style-type: none"> List of training, qualifications, certifications ADCI certifications Medical screening First AID/AED Oxygen provider First aid kit inventory List of equipment to be used on job Proof of annual maintenance Maintenance records on all equipment Hats – make/model Umbilicals (pull test date) Compressors (air certification) Wet suits Dry suits Air samples (certification) Job description: <ul style="list-style-type: none"> Estimated depth Estimated currents Estimate visibility Estimated temperatures Drawings, diagrams, photos of study area Task Hazard Analysis/Job Hazard Analysis Project-Specific Safe Work Plan/Dive Plan and Emergency Action Plan Dive manual Dive tables Float plan Acknowledgement of plans by personnel 	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
ACTIVITY 7 – Decontaminate equipment.	Lifting hazards/muscle strain	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3
	Potential contaminant exposure	10	<ul style="list-style-type: none"> Use proper tools for decontamination. Wear nitrile gloves, and chemical goggles during the decontamination process. Follow other Standard Operating Procedures (SOPs) for decontamination as specified in the Task Specific Field Sampling Plan. 	3
ACTIVITY 8 – Load/transport samples to on-shore facility for processing and shipping to lab.	Lifting hazards/muscle strain	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3
	Driving hazards	10	<ul style="list-style-type: none"> All drivers must have current, valid driver's license on their person. Complete pre-use visual inspection. Walk around the vehicle to inspect for potential hazards or mechanical issues before driving. Practice defensive driving and drive in a courteous manner. All drivers must have taken the AECOM defensive driving course. Seat belts must be worn by the driver and all passengers. Drivers must not use cellular telephones or other communication devices such as two-way radios unless safely parked. Window surfaces must be cleared of any materials such as ice, frost, mud, or water that can impair visibility. Equip vehicles with first aid kit, fire extinguisher, flares or triangle, spare tire and jack, and cell phone. Ensure all loads are properly secured. 	5

SPECIAL REQUIREMENTS

Step #	Equipment to be Used	Inspection Requirements	Training Requirements
	List equipment to be used in work activity	List inspection/permit requirements for work activity	List training requirements including hazard communication
1.	Research vessel	Perform boat inspection prior to use. Complete and submit float plan prior to use.	USCG-licensed vessel operator or equivalent. MOB recovery with limited assistance. First Aid/CPR Training. Approved boating safety course.
2.	Sediment traps	Daily inspection before use.	Employees operating equipment shall be experienced or trained in the specific use of the equipment for the purpose of the sampling effort.
3.	Diving equipment	Proof of annual maintenance and maintenance records on all equipment Umbilicals (pull test date) Compressors (air certification) Air samples (certification)	ADCI Certification Medical Screening
4.	Emergency equipment provided by vessel operator (Gravity): <ul style="list-style-type: none"> • First aid kit/AED • GPS • Satellite phone (if cell phone service does not cover entire survey area) • VHF radios will remain on Channel 16 (for hailing/distress calls) at all times to listen for boat traffic, alerts, etc. unless actively keying/communicating on another channel with another party • Rescue rope in throw bag (commercially available) • Air horns and/or whistles • Waterproof flashlight • *Secondary "kicker" motor and *alternate means of propulsion (oars or paddles) • *Bailer (if bilge pump is not provided, bucket, or similar device should be on board) • *Duct tape • *Length of rope for securing boat on shore or alongside larger vessel • *Functional bilge pump/emergency pump • *Anchor with five to seven times as much line as the depth of water plus the distance from the surface of the water to where the anchor will attach to the bow • *Type 4 throwable ring or cushion • *Type BC fire extinguisher (10 pound) if extra fuel is carried in portable containers. <p>* Required minimum equipment to be provided by vessel</p>	Inspect all equipment for battery life and integrity during the pre-trip boat inspection.	Personnel should be familiar with all emergency equipment.

	provider (chartered boat); project Field Coordinator to ensure remaining equipment is carried on board.		
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INSTRUCTIONS AND RISK MATRIX

Hazard Evaluation – Identify principal steps of the task. Identify potential safety/health hazards for each step and determine initial risk rating using the matrix provided below. Identify control measures including PPE for each hazard. Re-evaluate hazard potential and assign a final risk rating. If the final risk rating is a 5-9 (medium risk) or 10-25 (high risk), additional hazard controls shall be identified and applied until the final risk rating is reduced to 4 or below. The final risk rating cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin. Add additional rows as required to cover all major steps/aspects of the activity.

Special Requirements – Identify equipment to be used including specific PPE required. Identify inspection requirements such as competent person, permit issue, documented task hazard analysis, etc. Identify training requirements such as hazard communication, scaffold user, fall protection, etc.

		High ←————→ Low				
High ↑ ↓ Low	Probability	Severity				
		5 - Catastrophic	4 - Critical	3 - Major	2 - Moderate	1 - Minor
	5 - Frequent	25	20	15	10	5
	4 - Probable	20	16	12	8	4
	3 - Occasional	15	12	9	6	3
	2 - Remote	10	8	6	4	2
	1 - Improbable	5	4	3	2	1
10-25 (red) are high risk, 5-9 (yellow) are medium risk, and 1-4 (green) are low risk						

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>\$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>\$250K to \$1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> \$10K to \$250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> \$1K to \$10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</\$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur during task/activity	1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000
Risk Rating (Probability x Severity)		Risk Acceptance Authority
1 to 4 (Low)		Risk is tolerable, manage at local level
5 to 9 (Medium)		Risk requires approval by Operations Lead/Supervisor & SH&E Manager
10 to 25 (High)		Risk requires the approval of the Operations Manager & SH&E Director

Americas

Pre-Job Hazard Assessment

S3AM-209-FM4

Location: Portland Harbor (Subsurface Sediment Sampling)

Date: January 10, 2018

Prepared By: Linda Howard

Approved By: Jennifer Pretare

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
List principal activities involved in the scope of work	Identify each safety or health hazard		Identify engineering and administrative controls and any specific Personal Protective Equipment (PPE) that is required	
ACTIVITY 1 – Mobilize equipment and personnel to study area.	Traffic/driving hazards	10	<ul style="list-style-type: none"> All drivers must have current, valid driver's license on their person. Complete pre-use visual inspection. Walk around the vehicle to inspect for potential hazards or mechanical issues before driving. Practice defensive driving and drive in a courteous manner. All drivers must have taken the AECOM defensive driving course. Seat belts must be worn by the driver and all passengers. Obey all speed limits. Drivers must not use cellular telephones or other communication devices such as two-way radios unless safely parked. Window surfaces must be cleared of any materials such as ice, frost, mud, or water that can impair visibility. Travel with headlights on at all times. Travel during daylight hours when possible. Equip vehicles with first aid kit, fire extinguisher, flares or triangle, spare tire and jack, cell phone. Limit activities to no more than 10-hour days. Implement fatigue management plan for >12 hour days. 	5
	Parking hazards	10	Park in a clear location, and back in to parking location to avoid backing out upon departure.	3
	Lifting hazards/muscle strain	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			<ul style="list-style-type: none"> Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	
ACTIVITY 2 – Hold Tailgate Safety Briefings and perform daily Task Hazard Analysis; review applicable Safety, Health, and Environment (SH&E) Procedures; inspect and don PPE; inspect tools and equipment.	Incorrect PPE usage	10	Safety Officer should check that required PPE is being used.	1
	Equipment malfunction	10	User (AECOM and/or Subcontractor Personnel) should inspect equipment before use.	1
	Lack of knowledge of tasks being performed	10	Discuss tasks to be performed by personnel, potential hazards, and control measures.	1
	Potential incidents and emergencies	10	<ul style="list-style-type: none"> Follow daily safety briefing, have personnel sign attendance form, which will be maintained on-site. Inform workers of emergency contact information, emergency procedures, and hospital route. 	1
	Severe weather	10	Include discussion of severe weather hazards in daily safety briefing and monitor throughout the duration of the task. Implement severe weather procedures as applicable.	5
	Potential contaminant exposure	10	Inform workers of potential for contaminant exposure and implement contaminant exposure avoidance procedures outlined in HASP, as applicable.	3
ACTIVITY 3 – Evaluate area for hazards (this should be performed regularly throughout the duration of the task).	Slips, trips, and falls	8	Personnel should identify and take measurable cautionary steps to observe areas for hazards: ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices.	4
	Heat stress/cold stress	10	<ul style="list-style-type: none"> Begin heat stress/cold stress monitoring as applicable and continue throughout duration of task. Implement heat stress/cold stress prevention procedures, as applicable. Heat stress: drink plenty of fluids and use appropriate work/rest schedule. Cold stress: dress in appropriate cold-weather clothing and bring change of dry clothing stored in waterproof bag. 	3
	Water hazards	10	<ul style="list-style-type: none"> Follow all appropriate water safety rules and regulations. Use appropriate PPE. 	5
	Severe weather	10	Assess severe weather hazards and implement	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			appropriate severe weather procedures.	
	Potential contaminant exposure	10	Maintain awareness of potential contaminant exposure and implement contaminant avoidance procedures.	3
ACTIVITY 4 – Load personnel and equipment onto vessel.	Lifting hazards/muscle strain/ergonomic hazards	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. Transfer equipment to people on boat rather than carrying equipment onto boat. 	3
	Vessel boarding hazards	10	<ul style="list-style-type: none"> Receive vessel operator's training prior to boarding vessel. Follow vessel operator's instructions for boarding vessel. Wear appropriate PPE, including correct type of Personal Flotation Device (PFD). Maintain three points of contact when boarding vessel. Follow vessel operator's instructions for loading equipment onto vessel. 	4
	Pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never position a hand where it can be pinched if a wheel rotates, a load releases, or a tool slips.	4
	Slips, trips, and falls	8	<ul style="list-style-type: none"> Wear appropriate footwear with non-slip soles. Ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices. Maintain three points of contact when boarding vessel. 	4
ACTIVITY 5 – Work aboard a research vessel on water.	Slips, trips, and falls	8	<ul style="list-style-type: none"> Wear appropriate footwear with non-slip soles. Ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices. Maintain three points of contact at all times. 	4
	Lines under tension/line of fire	10	Avoid keeping lines/ropes/cables under tension. Keep as much distance as possible between you and any source of potential energy release.	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
	Moving parts/pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never position a hand where it can be pinched if a wheel rotates, a load releases, or a tool slips.	4
	Water hazards	10	<ul style="list-style-type: none"> Adhere to all federal, state, and local boating and licensing laws. Work must be performed in accordance with the "Buddy System" Regulations. US Coast Guard (USCG)-approved PFD, sized and adjusted to the wearer, shall be worn by all workers when aboard the research vessel. Vessel operator will provide a SH&E Orientation on boating operations prior to departing dock, which will cover the following: man overboard, power loss/disabled boat, fire onboard, medical emergency. Vessel operator will submit a float plan to the Project Manager and follow the float plan and communication plan identified in the float plan. Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Ensure vessel has secondary means of propulsion such as oars or paddles. Workers are to remain seated when vessel is in motion. Avoid standing in vessel whenever possible. 	4
	Man overboard (MOB)/incapacitated person	10	<p>Vessel operator will review USCG MOB procedures:</p> <ul style="list-style-type: none"> No low visibility/night operations will occur. When deploying equipment, do not lean over the boat. When boat is underway, all people must remain in the cabin seated or standing maintaining four points of contact; no work on deck may occur. All staff aboard vessel will be trained in MOB recovery training. Perform safety briefing prior to departure and discuss MOB recovery procedure. Wear Type I, II, or III PFD AT ALL TIMES on board a boat or on dock. Person who observes person fall overboard must keep their eyes on him/her. Immediately cease work operations and commence a rescue procedure. Bring the vessel to the position of the person in the water (as opposed to having the person swim to the boat). 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			<ul style="list-style-type: none"> Immediately mark MOB location on GPS by "one-button MOB press." Throw a MOB pole marker/raise a MOB flag into the water to denote the location of the person overboard and to alert other boat traffic. Throw PFDs or other floatable items into the water to assist the person overboard. Send a distress call on Channel 16 if person is unresponsive or severely injured. 	
	Boat in danger of sinking	10	<p>Vessel operator will be responsible; however, if the vessel crew is incapacitated, the following procedure shall be followed:</p> <ul style="list-style-type: none"> Send a distress call: PAN call over VHF Channel 16 if boat is not in imminent danger. Send a distress call: MAYDAY call over VHF Channel 16 if boat is in imminent danger. Turn on the bilge pump to begin pumping water to outside of boat. Assemble the emergency pump and begin pumping water. 	4
	Vessel fire	10	<p>Review fire extinguisher location and quantity and confirm fire extinguishers are charged prior to leaving dock. Remember P.A.S.S.:</p> <ul style="list-style-type: none"> Pull the Pin Aim the fire extinguisher at the base of the fire Squeeze the handle Sweep the base of fire side to side <p>Hail for help. See Distress Call Form MAYDAY (life/death) or PAN (assistance required, not life and death).</p> <p>Inflate life raft/abandon ship if necessary (e.g., risk of explosion).</p>	5
	Medical emergency	8	<ul style="list-style-type: none"> Review first aid kit location and contents prior to departure. AED shall be rented for the work. If a severe injury occurs, initiate a MAYDAY call. Contact the AECOM Incident Reporting line after the emergency has been addressed. 	4
	Heat stress/cold stress	10	<ul style="list-style-type: none"> Begin heat stress/cold stress monitoring as applicable and continue throughout duration of task. Implement heat stress/cold stress prevention 	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			procedures, as applicable. <ul style="list-style-type: none"> Heat stress: drink plenty of fluids and use appropriate work/rest schedule. Cold stress: dress in appropriate cold-weather clothing and bring change of dry clothing stored in waterproof bag. 	
	Severe weather hazards	10	Include discussion of severe weather hazards in daily safety briefing and monitor throughout the duration of the task. Implement severe weather procedures as applicable. Stop work during severe weather.	4
	Other commercial/recreational vessel traffic hazards	10	Adhere to all federal, state, and local boating and licensing laws.	5
ACTIVITY 6 – Use a Vibracore System to collect subsurface sediment samples.	Drill operation (Vibracore System)	10	<ul style="list-style-type: none"> Verify that operator is qualified and working in a safe manner. Ensure that all personnel are familiar with the location of the Emergency Shut-off switches on the drill rig prior to operation and maintain a suitable distance from the operating drilling. Drill rig (Vibracore System or Van Veen) operator needs to complete drill rig inspection form daily prior to initiating project activities. Use hard hats, safety glasses, high visibility PFD. Maintain awareness of the potential of contaminant exposure, and implement contaminant exposure avoidance procedures. 	5
	Moving parts/pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never position a hand where it can be pinched if a wheel rotates, a load releases, or a tool slips.	4
ACTIVITY 7 – Remove the sediment core, cut, and cap. A sawzall will be used to cut the sediment core to manageable lengths.	Lifting hazards/muscle strain	6	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3
	Power tools	9	<ul style="list-style-type: none"> Employees should work only with tools with which they are appropriately trained and familiar and should receive specific instruction on use and operation of unfamiliar tools. Use tools only for their designated use and in 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			accordance with manufacturer's specifications. <ul style="list-style-type: none"> • Use approved tools only. Never modify or use makeshift tools. • Ensure proper ergonomics principles are observed when using power tools. • Avoid placing fingers in danger zones; ensure sufficient clearance in the event the tool slips. • Secure tools when not in use. • When using saw blades, direct tools away from other employees working in close proximity. • Do not allow loose clothing, long hair, loose jewelry, or rings and chains to be worn when working with power tools. 	
	Potential contaminant exposure	10	<ul style="list-style-type: none"> • Maintain awareness of potential contaminant exposure and implement avoidance procedures. • Use appropriate PPE, including nitrile gloves. 	3
ACTIVITY 8 – Move the sediment core to the on-deck storage area and secure in a vertical position.	Lifting hazards/muscle strain	10	<ul style="list-style-type: none"> • Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. • Wear abrasion gloves when moving equipment. • No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3
	Potential contaminant exposure	10	<ul style="list-style-type: none"> • Maintain awareness of potential contaminant exposure and implement avoidance procedures. • Use appropriate PPE, including nitrile gloves. 	3
ACTIVITY 9 – Use hand drill to drill a small hole in the sediment core to drain excess water out once the sediment sample has settled.	Power tools	9	<ul style="list-style-type: none"> • Employees should work only with tools with which they are appropriately trained and familiar and should receive specific instruction on use and operation of unfamiliar tools. • Use tools only for their designated use and in accordance with manufacturer's specifications. • Use approved tools only. Never modify or use makeshift tools. • Ensure proper ergonomics principles are observed when using power tools. • Avoid placing fingers in danger zones; ensure sufficient clearance in the event the tool slips. • Secure tools when not in use. • Do not allow loose clothing, long hair, loose jewelry, rings and chains to be worn when working with power tools. 	3
	Potential contaminant exposure	10	<ul style="list-style-type: none"> • Maintain awareness of potential contaminant exposure and implement avoidance procedures. 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
ACTIVITY 10 – Move sediment cores off vessel by hand once docked.	Lifting hazards/muscle strain/ergonomic hazards	10	<ul style="list-style-type: none"> • Use appropriate PPE, including nitrile gloves. • Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. • Wear abrasion gloves when moving equipment. • No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. • Transfer equipment to people on boat rather than carrying equipment onto boat. 	3
	Vessel offloading hazards	10	<ul style="list-style-type: none"> • Follow vessel operator's instructions for leaving vessel. • Maintain three points of contact when leaving vessel. • Follow vessel operator's instructions for transferring equipment and samples off vessel. 	5
	Potential contaminant exposure	10	<ul style="list-style-type: none"> • Use proper tools for decontamination. • Wear appropriate PPE. • Place spent decontamination water in appropriate containers or jugs, or discharge to site water as appropriate. 	3
ACTIVITY 11 – Decontaminate equipment.	Lifting hazards/muscle strain	10	<ul style="list-style-type: none"> • Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. • Wear abrasion gloves when moving equipment. • Wear chemical resistant gloves over abrasion resistant gloves when handling contaminated equipment. • No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3
	Potential contaminant exposure	10	<ul style="list-style-type: none"> • Use proper tools for decontamination. • Wear nitrile gloves, and chemical goggles during the decontamination process • Follow other Standard Operating Procedures (SOPs) for decontamination as specified in the Task Specific Field Sampling Plan. 	3
ACTIVITY 12 – Load/transport sediment cores to warehouse for processing.	Lifting hazards/muscle strain	10	<ul style="list-style-type: none"> • Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. • Wear abrasion gloves when moving equipment. • No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			before lifting or test them carefully.	
	Driving hazards	10	<ul style="list-style-type: none"> All drivers must have current, valid driver's license on their person. Complete pre-use visual inspection. Walk around the vehicle to inspect for potential hazards or mechanical issues before driving. Practice defensive driving and drive in a courteous manner. All drivers must have taken the AECOM defensive driving course. Seat belts must be worn by the driver and all passengers. Drivers must not use cellular telephones or other communication devices such as two-way radios unless safely parked. Window surfaces must be cleared of any materials such as ice, frost, mud, or water that can impair visibility. Equip vehicles with first aid kit, fire extinguisher, flares or triangle, spare tire and jack, and cell phone. Ensure all loads are properly secured. 	5
ACTIVITY 13 – Process sediment samples at warehouse.	Lifting hazards/muscle strain	6	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3
	Hand tools	6	<ul style="list-style-type: none"> Employees should work only with tools with which they are appropriately trained and familiar and should receive specific instruction on use and operation of unfamiliar tools. Use tools only for their designated use and in accordance with manufacturer's specifications. Use approved tools only. Never modify or use makeshift tools. Ensure proper ergonomics principles are observed when using power tools. Avoid placing fingers in danger zones; ensure sufficient clearance in the event the tool slips. Secure tools when not in use. Do not allow loose clothing, long hair, loose jewelry, rings and chains to be worn when working with power tools. 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
	Potential contaminant exposure	10	<ul style="list-style-type: none"> • Maintain awareness of potential contaminant exposure and implement avoidance procedures. • Use appropriate PPE, including nitrile gloves. 	3
	Ergonomic hazards	9	Follow proper ergonomic practices.	3
ACTIVITY 14 – Ship sediment samples to lab for processing.	Lifting hazards/muscle strain	10	<ul style="list-style-type: none"> • Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. • Wear abrasion gloves when moving equipment. • No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3

SPECIAL REQUIREMENTS

Step #	Equipment to be Used	Inspection Requirements	Training Requirements
	List equipment to be used in work activity	List inspection/permit requirements for work activity	List training requirements including hazard communication
1.	Research vessel	Perform boat inspection prior to use. Complete and submit float plan prior to use.	USCG-licensed vessel operator or equivalent. MOB recovery with limited assistance. First Aid/CPR Training. Approved boating safety course.
2.	Vibracore System	Daily inspection before use. Machinery and mechanized equipment inspection form completed prior to project start.	Employees operating equipment shall be experienced or trained in the specific use of the equipment for the purpose of the sampling effort. Only Gravity crew will operate the Vibracore system.
3.	Power tools (drill, sawzall)	Inspect prior to use. Do not use any tool that is defective or has missing parts.	Employees operating power tools shall be familiar with the use and operation of the equipment or have received specific instruction on its use and operation.
4.	Emergency equipment provided by vessel operator (Gravity): <ul style="list-style-type: none"> • GPS • Satellite phone (if cell phone service does not cover entire survey area) • VHF radios will remain on Channel 16 (for hailing/distress calls) at all times to listen for boat traffic, alerts, etc. unless actively keying/communicating on another channel with another party • Rescue rope in throw bag (commercially available) • Air horns and/or whistles • Waterproof flashlight • *Secondary "kicker" motor and *alternate means of propulsion (oars or paddles) • *Bailer (if bilge pump is not provided, bucket, or similar device should be on board) • *Duct tape • *Length of rope for securing boat on shore or alongside larger vessel • *Functional bilge pump/emergency pump • *Anchor with five to seven times as much line as the depth of water plus the distance from the surface of the water to where the anchor will attach to the bow • *Type 4 throwable ring or cushion • *Type BC fire extinguisher (10 pound) if extra fuel is carried in portable containers. <p>* Required minimum equipment to be provided by vessel provider (chartered boat); project Field Coordinator to</p>	Inspect all equipment for battery life and integrity during the pre-trip boat inspection.	Personnel should be familiar with all emergency equipment.

	ensure remaining equipment is carried on board.		
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INSTRUCTIONS AND RISK MATRIX

Hazard Evaluation – Identify principal steps of the task. Identify potential safety/health hazards for each step and determine initial risk rating using the matrix provided below. Identify control measures including PPE for each hazard. Re-evaluate hazard potential and assign a final risk rating. If the final risk rating is a 5-9 (medium risk) or 10-25 (high risk), additional hazard controls shall be identified and applied until the final risk rating is reduced to 4 or below. The final risk rating cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin. Add additional rows as required to cover all major steps/aspects of the activity.

Special Requirements – Identify equipment to be used including specific PPE required. Identify inspection requirements such as competent person, permit issue, documented task hazard analysis, etc. Identify training requirements such as hazard communication, scaffold user, fall protection, etc.

		High ←————→ Low				
Probability		Severity				
		5 - Catastrophic	4 - Critical	3 - Major	2 - Moderate	1 - Minor
High ↑ ↓ Low	5 - Frequent	25	20	15	10	5
	4 - Probable	20	16	12	8	4
	3 - Occasional	15	12	9	6	3
	2 - Remote	10	8	6	4	2
	1 - Improbable	5	4	3	2	1
10-25 (red) are high risk, 5-9 (yellow) are medium risk, and 1-4 (green) are low risk						

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>\$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>\$250K to \$1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> \$10K to \$250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> \$1K to \$10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</\$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur during task/activity	1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000
Risk Rating (Probability x Severity)		Risk Acceptance Authority
1 to 4 (Low)		Risk is tolerable, manage at local level
5 to 9 (Medium)		Risk requires approval by Operations Lead/Supervisor & SH&E Manager
10 to 25 (High)		Risk requires the approval of the Operations Manager & SH&E Director

Americas

Pre-Job Hazard Assessment

S3AM-209-FM4

Location: Surface Sediment Sampling

Date: January 10, 2018

Prepared By: Linda Howard

Approved By: Jennifer Pretare

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
List principal activities involved in the scope of work	Identify each safety or health hazard		Identify engineering and administrative controls and any specific Personal Protective Equipment (PPE) that is required	
ACTIVITY 1 – Mobilize equipment and personnel to study area.	Traffic/driving hazards	10	<ul style="list-style-type: none"> All drivers must have current, valid driver's license on their person. Complete pre-use visual inspection. Walk around the vehicle to inspect for potential hazards or mechanical issues before driving. Practice defensive driving and drive in a courteous manner. All drivers must have taken the AECOM defensive driving course. Seat belts must be worn by the driver and all passengers. Obey all speed limits. Drivers must not use cellular telephones or other communication devices such as two-way radios unless safely parked. Window surfaces must be cleared of any materials such as ice, frost, mud, or water that can impair visibility. Travel with headlights on at all times. Travel during daylight hours when possible. Equip vehicles with: first aid kit, fire extinguisher, flares or triangle, spare tire and jack, cell phone. Limit activities to no more than 10-hour days. Implement fatigue management plan for >12 hour days. 	5
	Parking hazards	10	Park in a clear location, back in to parking location to avoid backing out upon departure.	3
	Lifting hazards/muscle strain	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, seek assistance or employ additional handling equipment as needed. 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			<ul style="list-style-type: none"> Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully.	
ACTIVITY 2 – Hold Tailgate Safety Briefings and perform daily Task Hazard Analysis; review applicable Safety, Health, and Environment (SH&E) Procedures; inspect and don PPE; Inspect tools and equipment.	Incorrect PPE usage	10	Safety Officer should check that required PPE is being used.	1
	Equipment malfunction	10	User (AECOM and/or Subcontractor Personnel) should inspect equipment before use.	1
	Lack of knowledge of tasks being performed	10	Discuss tasks to be performed by personnel, potential hazards, and control measures.	1
	Potential incidents and emergencies	10	<ul style="list-style-type: none"> Follow daily safety briefing, have personnel sign attendance form, which will be maintained on-site. Inform workers of emergency contact information, emergency procedures, and hospital route. 	1
	Severe weather	10	Include discussion of severe weather hazards in daily safety briefing and monitor throughout the duration of the task. Implement severe weather procedures as applicable.	5
	Potential contaminant exposure	10	Inform workers of potential for contaminant exposure and implement contaminant exposure avoidance procedures outlined in HASP, as applicable.	3
ACTIVITY 3 – Evaluate area for hazards (this should be performed regularly throughout the duration of the task).	Slips, trips, and falls	8	Personnel should identify and take measurable cautionary steps to observe areas for hazards: ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices.	4
	Heat stress/cold stress	10	<ul style="list-style-type: none"> Begin heat stress/cold stress monitoring as applicable and continue throughout duration of task. Implement heat stress/cold stress prevention procedures, as applicable. Heat stress: drink plenty of fluids and use appropriate work/rest schedule. Cold stress: dress in appropriate cold-weather clothing and bring change of dry clothing stored in waterproof bag. 	3
	Water hazards	10	<ul style="list-style-type: none"> Follow all appropriate water safety rules and regulations. Use appropriate PPE. 	5
	Severe weather	10	Assess severe weather hazards and implement	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			appropriate severe weather procedures.	
	Potential contaminant exposure	10	Maintain awareness of potential contaminant exposure and implement contaminant avoidance procedures.	3
ACTIVITY 4 – Load personnel and equipment onto vessel.	Lifting hazards/muscle strain	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. Transfer equipment to people on boat rather than carrying equipment onto boat. 	3
	Vessel boarding hazards	10	<ul style="list-style-type: none"> Receive vessel operator's training prior to boarding vessel. Follow vessel operator's instructions for boarding vessel. Wear appropriate PPE, including correct type of Personal Flotation Device (PFD). Maintain three points of contact when boarding vessel. Follow vessel operator's instructions for loading equipment onto vessel. 	4
	Pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never position a hand where it can be pinched if a wheel rotates, a load releases, or a tool slips.	4
	Slips, trips, and falls	8	<ul style="list-style-type: none"> Wear appropriate footwear with non-slip soles. Ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices. Maintain three points of contact when boarding vessel. 	4
ACTIVITY 5 – Work aboard a research vessel on water.	Slips, trips, and falls	8	<ul style="list-style-type: none"> Wear appropriate footwear with non-slip soles. Ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices. Maintain three points of contact at all times. 	4
	Lines under tension/line of fire	10	Avoid keeping lines/ropes/cables under tension. Keep as much distance as possible between you and any	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			source of potential energy release.	
	Moving parts/pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never position a hand where it can be pinched if a wheel rotates, a load releases, or a tool slips.	4
	Water hazards	10	<ul style="list-style-type: none"> Adhere to all federal, state, and local boating and licensing laws. Work must be performed in accordance with the "Buddy System" Regulations. US Coast Guard (USCG)-approved Personal Flotation Device (PFD), sized and adjusted to the wearer, shall be worn by all workers when aboard the research vessel. Vessel operator will provide a SH&E Orientation on boating operations prior to departing dock, which will cover the following: man overboard, power loss/disabled boat, fire onboard, medical emergency. Vessel operator will submit a float plan to the Project Manager and follow the float plan and communication plan identified in the float plan. Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Ensure vessel has secondary means of propulsion such as oars or paddles. Workers are to remain seated when vessel is in motion. Avoid standing in vessel whenever possible. 	4
	Man overboard (MOB)/incapacitated person	10	Vessel operator will review USCG MOB procedures: <ul style="list-style-type: none"> No low visibility/night operations will occur. When deploying equipment, do not lean over the boat. When boat is underway, all people must remain in the cabin seated or standing maintaining four points of contact; no work on deck may occur. All staff aboard vessel will be trained in MOB recovery training. Perform safety briefing prior to departure and discuss MOB recovery procedure. Wear Type I, II, or III PFD AT ALL TIMES on board a boat or on dock Person who observes person fall overboard must keep their eyes on him/her. Immediately cease work operations and commence a rescue procedure. 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			<ul style="list-style-type: none"> Bring the vessel to the position of the person in the water (as opposed to having the person swim to the boat). Immediately mark MOB location on GPS by "one-button MOB press." Throw a MOB pole marker/raise a MOB flag into the water to denote the location of the person overboard and to alert other boat traffic. Throw PFDs or other floatable items into the water to assist the person overboard. Send a distress call on Channel 16 if person is unresponsive or severely injured. 	
	Boat in danger of sinking	10	<p>Vessel operator will be responsible; however, if the vessel crew is incapacitated, the following procedure shall be followed:</p> <ul style="list-style-type: none"> Send a distress call: PAN call over VHF Channel 16 if boat is not in imminent danger. Send a distress call: MAYDAY call over VHF Channel 16 if boat is in imminent danger. Turn on the bilge pump to begin pumping water to outside of boat. Assemble the emergency pump and begin pumping water. 	4
	Vessel fire	10	<p>Review fire extinguisher location and quantity, and confirm fire extinguishers are charged prior to leaving dock</p> <p>Remember P.A.S.S:</p> <ul style="list-style-type: none"> Pull the Pin Aim the fire extinguisher at the base of the fire Squeeze the handle Sweep the base of fire side to side <p>Hail for help See Distress Call Form MADAY (life/death) or PAN (assistance required, not life and death)</p> <p>Inflate life raft/abandon ship if necessary (e.g., risk of explosion).</p>	5
	Medical emergency	8	<ul style="list-style-type: none"> Review first aid kit location and contents prior to departure. AED shall be rented for the work. If a severe injury occurs, initiate a MAYDAY call. Contact the AECOM Incident Reporting line after the emergency has been addressed. 	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
	Heat stress/cold stress	10	<ul style="list-style-type: none"> Begin heat stress/cold stress monitoring as applicable and continue throughout duration of task. Implement heat stress/cold stress prevention procedures, as applicable. Heat stress: drink plenty of fluids and use appropriate work/rest schedule. Cold stress: dress in appropriate cold-weather clothing and bring change of dry clothing stored in waterproof bag. 	5
	Severe weather hazards	10	Include discussion of severe weather hazards in daily safety briefing and monitor throughout the duration of the task. Implement severe weather procedures as applicable. Stop work during severe weather.	4
	Other commercial/recreational vessel traffic hazards	10	Adhere to all federal, state, and local boating and licensing laws.	5
ACTIVITY 6 – Use a Van Veen clamshell grab system to collect the surface sediment samples.	Clamshell operation (Van Veen system)	10	<ul style="list-style-type: none"> Verify that operator is qualified and working in a safe manner. Ensure that all personnel are familiar with the location of the Emergency Shut-off switches prior to operation and maintain a suitable distance from the operating equipment. Clamshell (Van Veen) operator needs to complete equipment inspection form daily prior to initiating study activities. Use appropriate PPE, including PFD. 	5
	Moving parts/pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never position a hand where it can be pinched if a wheel rotates, a load releases, or a tool slips.	4
ACTIVITY 7 – Process samples on board vessel. Sediment sample will be transferred to a tub, and a drill and paint mixer will be use to homogenize the sample. Smaller samples will then be transferred to sample containers and stored until transported to shore for further processing.	Power tools	6	<ul style="list-style-type: none"> Employees should work only with tools with which they are appropriately trained and familiar and should receive specific instruction on use and operation of unfamiliar tools. Use tools only for their designated use and in accordance with manufacturer's specifications. Use approved tools only. Never modify or use makeshift tools. Ensure proper ergonomics principles are observed when using power tools. Avoid placing fingers in danger zones; ensure sufficient clearance in the event the tool slips. Secure tools when not in use. 	2

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			<ul style="list-style-type: none"> Do not allow loose clothing, long hair, loose jewelry, or rings and chains to be worn when working with power tools. 	
	Potential contaminant exposure	10	<ul style="list-style-type: none"> Maintain awareness of potential contaminant exposure and implement avoidance procedures. Use appropriate PPE, including nitrile gloves. 	1
ACTIVITY 8 – Move sediment samples off vessel by hand once docked.	Lifting hazards/muscle strain/ergonomic hazards	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. Transfer equipment to people on boat rather than carrying equipment onto boat. 	3
	Vessel offloading hazards	10	<ul style="list-style-type: none"> Follow vessel operator's instructions for leaving vessel. Maintain three points of contact when leaving vessel. Follow vessel operator's instructions for transferring equipment and samples off vessel. 	5
	Potential contaminant exposure	10	<ul style="list-style-type: none"> Use proper tools for decontamination. Wear appropriate PPE. Follow other Standard Operating Procedures (SOPs) for decontamination as specified in the Task Specific Field Sampling Plan. 	3
ACTIVITY 9 – Decontaminate equipment.	Lifting hazards/muscle strain	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3
	Potential contaminant exposure	1	<ul style="list-style-type: none"> Use proper tools for decontamination. Wear nitrile gloves, and chemical goggles during the decontamination process Follow other Standard Operating Procedures (SOPs) for decontamination as specified in the Task Specific Field Sampling Plan. 	1
Activity 10 – Load/transport samples to	Lifting hazards/muscle strain/ergonomic	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of 	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
warehouse for processing.	hazards		materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. <ul style="list-style-type: none"> • Wear abrasion gloves when moving equipment. • No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	
	Driving hazards	10	<ul style="list-style-type: none"> • All drivers must have current, valid driver's license on their person. • Complete pre-use visual inspection - walk around the vehicle to inspect for potential hazards or mechanical issues before driving. • Practice defensive driving and drive in a courteous manner. All drivers must have taken the AECOM defensive driving course. • Seat belts must be worn by the driver and all passengers. • Drivers must not use cellular telephones or other communication devices such as two-way radios unless safely parked. • Window surfaces must be cleared of any materials such as ice, frost, mud, or water that can impair visibility. • Equip vehicles with first aid kit, fire extinguisher, flares or triangle, spare tire and jack, and cell phone. • Ensure all loads are properly secured. 	5

SPECIAL REQUIREMENTS

Step #	Equipment to be Used	Inspection Requirements	Training Requirements
	List equipment to be used in work activity	List inspection/permit requirements for work activity	List training requirements including hazard communication
1.	Research vessel	Perform boat inspection prior to use. Complete and submit float plan prior to use.	USCG-licensed vessel operator or equivalent. MOB recovery with limited assistance. First Aid/CPR Training. Approved boating safety course.
2.	Van Veen clamshell grab system	Daily inspection before use. Machinery and mechanized equipment inspection form completed prior to project start.	Employees operating equipment shall be experienced or trained in the specific use of the equipment for the purpose of the sampling effort. Only Gravity crew will operate clamshell grab system.
3.	Power tools (drill and paint mixer)	Inspect prior to use. Do not use any tool that is defective or has missing parts.	Employees operating power tools shall be familiar with the use and operation of the equipment or have received specific instruction on its use and operation.
4.	Emergency equipment provided by vessel operator (Gravity): <ul style="list-style-type: none"> • GPS • Satellite phone (if cell phone service does not cover entire survey area) • VHF radios will remain on Channel 16 (for hailing/distress calls) at all times to listen for boat traffic, alerts, etc. unless actively keying/communicating on another channel with another party • Rescue rope in throw bag (commercially available) • Air horns and/or whistles • Waterproof flashlight • *Secondary "kicker" motor and *alternate means of propulsion (oars or paddles) • *Bailer (if bilge pump is not provided, bucket, or similar device should be on board) • *Duct tape • *Length of rope for securing boat on shore or alongside larger vessel • *Functional bilge pump/emergency pump • *Anchor with five to seven times as much line as the depth of water plus the distance from the surface of the water to where the anchor will attach to the bow • *Type 4 throwable ring or cushion • *Type BC fire extinguisher (10 pound) if extra fuel is carried in portable containers. <p>* Required minimum equipment to be provided by vessel provider (chartered boat); project Field Coordinator to</p>	Inspect all equipment for battery life and integrity during the pre-trip boat inspection.	Personnel should be familiar with all emergency equipment.

	ensure remaining equipment is carried on board.		
5.	36T	36T	36T
6.	36T	36T	36T
7.	36T	36T	36T
8.	36T	36T	36T
9.	36T	36T	36T

INSTRUCTIONS AND RISK MATRIX

Hazard Evaluation – Identify principal steps of the task. Identify potential safety/health hazards for each step and determine initial risk rating using the matrix provided below. Identify control measures including PPE for each hazard. Re-evaluate hazard potential and assign a final risk rating. If the final risk rating is a 5-9 (medium risk) or 10-25 (high risk), additional hazard controls shall be identified and applied until the final risk rating is reduced to 4 or below. The final risk rating cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin. Add additional rows as required to cover all major steps/aspects of the activity.

Special Requirements – Identify equipment to be used including specific PPE required. Identify inspection requirements such as competent person, permit issue, documented task hazard analysis, etc. Identify training requirements such as hazard communication, scaffold user, fall protection, etc.

		High ←————→ Low				
Probability		Severity				
		5 - Catastrophic	4 - Critical	3 - Major	2 - Moderate	1 - Minor
High ↑ ↓ Low	5 - Frequent	25	20	15	10	5
	4 - Probable	20	16	12	8	4
	3 - Occasional	15	12	9	6	3
	2 - Remote	10	8	6	4	2
	1 - Improbable	5	4	3	2	1
10-25 (red) are high risk, 5-9 (yellow) are medium risk, and 1-4 (green) are low risk						

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>\$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>\$250K to \$1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> \$10K to \$250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> \$1K to \$10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</\$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur during task/activity	1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000

Risk Rating (Probability x Severity)	Risk Acceptance Authority
1 to 4 (Low)	Risk is tolerable, manage at local level
5 to 9 (Medium)	Risk requires approval by Operations Lead/Supervisor & SH&E Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & SH&E Director

Americas

Pre-Job Hazard Assessment

S3AM-209-FM4

Location: Surface Water Sampling

Date: December 22, 2017

Prepared By: Linda Howard

Approved By: Jennifer Pretare

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
List principal activities involved in the scope of work	Identify each safety or health hazard		Identify engineering and administrative controls and any specific Personal Protective Equipment (PPE) that is required	
ACTIVITY 1 – Mobilize personnel and equipment to study area.	Traffic/driving hazards	10	<ul style="list-style-type: none"> All drivers must have current, valid driver's license on their person. Complete pre-use visual inspection. Walk around the vehicle to inspect for potential hazards or mechanical issues before driving. Practice defensive driving and drive in a courteous manner. All drivers must have taken the AECOM defensive driving course. Seat belts must be worn by the driver and all passengers. Obey all speed limits. Drivers must not use cellular telephones or other communication devices such as two-way radios unless safely parked. Window surfaces must be cleared of any materials such as ice, frost, mud, or water that can impair visibility. Travel with headlights on at all times. Travel during daylight hours when possible. Equip vehicles with: first aid kit, fire extinguisher, flares or triangle, spare tire and jack, cell phone. Limit activities to no more than 10-hour days. Implement fatigue management plan for >12 hour days. 	5
	Parking hazards	10	Park in a clear location, and back in to parking location to avoid backing out upon departure	3
	Lifting hazards/muscle strain	6	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			assistance or mechanical aid. Know what items weigh before lifting or test them carefully.	
ACTIVITY 2 – Hold Tailgate Safety Briefings and perform daily Task Hazard Analysis; review applicable Safety, Health, and Environment (SH&E) Procedures; inspect and don PPE; inspect tools and equipment.	Incorrect PPE usage	10	Safety Officer should check that required PPE is being used.	1
	Equipment malfunction	10	User (AECOM and/or Subcontractor Personnel) should inspect equipment before use.	1
	Lack of knowledge of tasks being performed	10	Discuss tasks to be performed by personnel, potential hazards, and control measures.	1
	Potential incidents and emergencies	10	<ul style="list-style-type: none"> Follow daily safety briefing, have personnel sign attendance form, which will be maintained onsite. Inform workers of emergency contact information, emergency procedures, and hospital route. 	5
	Severe weather	10	Include discussion of severe weather hazards in daily safety briefing and monitor throughout the duration of the task. Implement severe weather procedures as applicable.	5
	Potential contaminant exposure	10	Inform workers of potential for contaminant exposure and implement contaminant exposure avoidance procedures outlined in HASP, as applicable.	3
ACTIVITY 3 – Evaluate area for hazards (this should be performed regularly throughout the duration of the task).	Slips, trips, and falls	8	Personnel should identify and take measurable cautionary steps to observe areas for hazards: ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices.	4
	Heat stress/cold stress	10	<ul style="list-style-type: none"> Begin heat stress/cold stress monitoring as applicable and continue throughout duration of task. Implement heat stress/cold stress prevention procedures, as applicable. Heat stress: drink plenty of fluids and use appropriate work/rest schedule. Cold stress: dress in appropriate cold-weather clothing and bring change of dry clothing stored in waterproof bag. 	3
	Water hazards	10	<ul style="list-style-type: none"> Follow all appropriate water safety rules and regulations. Use appropriate PPE. 	5
	Severe weather	10	Assess severe weather hazards and implement appropriate severe weather procedures.	5
	Potential contaminant exposure	1	Maintain awareness of potential contaminant exposure and implement contaminant avoidance procedures.	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
ACTIVITY 4 – Load personnel and equipment onto vessel.	Lifting hazards/muscle strain/ergonomics hazards	10	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. Transfer equipment to people on boat rather than carrying equipment onto boat. 	3
	Vessel boarding hazards	10	<ul style="list-style-type: none"> Receive vessel operator's training prior to boarding vessel. Follow vessel operator's instructions for boarding vessel. Wear appropriate PPE, including correct type of Personal Flotation Device (PFD). Maintain three points of contact when boarding vessel. Follow vessel operator's instructions for loading equipment onto vessel. 	4
	Pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never position a hand where it can be pinched if a wheel rotates, a load releases, or a tool slips.	4
	Slips, trips, and falls	8	<ul style="list-style-type: none"> Wear appropriate footwear with non-slip soles. Ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices. Maintain three points of contact when boarding vessel. 	4
ACTIVITY 5 – Work aboard a research vessel on water.	Slips, trips, and falls	8	<ul style="list-style-type: none"> Wear appropriate footwear with non-slip soles. Ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices. Maintain three points of contact at all times. 	4
	Lines under tension/line of fire	10	Avoid keeping lines/ropes/cables under tension. Keep as much distance as possible between you and any source of potential energy release.	4
	Moving parts/pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never position a hand where it can be pinched if a wheel rotates, a load releases, or a tool slips.	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
	Water hazards	10	<ul style="list-style-type: none"> Adhere to all federal, state, and local boating and licensing laws. Work must be performed in accordance with the "Buddy System" Regulations. US Coast Guard (USCG)-approved PFD, sized and adjusted to the wearer, shall be worn by all workers when aboard the research vessel. Vessel operator will provide a SH&E Orientation on boating operations prior to departing dock, which will cover the following: man overboard, power loss/disabled boat, fire onboard, medical emergency. Vessel operator will submit a float plan to the Project Manager and follow the float plan and communication plan identified in the float plan. Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Ensure vessel has secondary means of propulsion such as oars or paddles. Workers are to remain seated when vessel is in motion. Avoid standing in vessel whenever possible. 	4
	Man overboard (MOB)/incapacitated person	10	<p>Vessel operator will review USCG MOB procedures:</p> <ul style="list-style-type: none"> No low visibility/night operations will occur. When deploying equipment, do not lean over the boat. When boat is underway, all people must remain in the cabin seated or standing maintaining four points of contact; no work on deck may occur. All staff aboard vessel will be trained in MOB recovery training. Perform safety briefing prior to departure and discuss MOB recovery procedure. Wear Type I, II, or III PFD AT ALL TIMES on board a boat or on dock Person who observes person fall overboard must keep their eyes on him/her. Immediately cease work operations and commence a rescue procedure. Bring the vessel to the position of the person in the water (as opposed to having the person swim to the boat). Immediately mark MOB location on GPS by "one-button MOB press". Throw a MOB pole marker/raise a MOB flag into the water to denote the location of the person overboard and to alert other boat traffic. Throw PFDs or other floatable items into the water to 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			assist the person overboard. • Send a distress call on Channel 16 if person is un-responsive or severely injured.	
	Boat in danger of sinking	10	Vessel operator will be responsible, however, if the vessel crew is incapacitated the following procedure shall be followed: • Send a distress call: PAN call over VHF Channel 16 if boat is not in imminent danger. • Send a distress call: MAYDAY call over VHF Channel 16 if boat is in imminent danger. • Turn on the bilge pump to begin pumping water to outside of boat. • Assemble the emergency pump and begin pumping water.	4
	Vessel fire	10	Review fire extinguisher location and quantity and confirm fire extinguishers are charged prior to leaving dock Remember P.A.S.S: • Pull the Pin • Aim the fire extinguisher at the base of the fire • Squeeze the handle • Sweep the base of fire side to side Hail for help See Distress Call Form MAYDAY (life/death) or PAN (assistance required, not life and death). Inflate life raft/abandon ship if necessary (e.g. risk of explosion).	5
	Medical emergency	8	• Review first aid kit location and contents prior to departure. • AED shall be rented for the work. • If a severe injury occurs, initiate a MAYDAY call. • Contact the AECOM Incident Reporting line after the emergency has been addressed.	4
	Heat stress/cold stress	10	• Begin heat stress/cold stress monitoring as applicable and continue throughout duration of task. • Implement heat stress/cold stress prevention procedures, as applicable. • Heat stress: drink plenty of fluids and use appropriate work/rest schedule. • Cold stress: dress in appropriate cold-weather clothing and bring change of dry clothing stored in waterproof bag.	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
	Severe weather hazards	10	Include discussion of severe weather hazards in daily safety briefing and monitor throughout the duration of the task. Implement severe weather procedures as applicable. Stop work during severe weather.	4
	Other commercial/recreational vessel traffic hazards	10	Adhere to all federal, state, and local boating and licensing laws.	5
ACTIVITY 6 – Locate sample locations using a differential global positioning system. Measure water depth at sampling station using a lead line.	Potential contaminant exposure	10	<ul style="list-style-type: none"> Maintain awareness of potential contaminant exposure and implement avoidance procedures. Use appropriate PPE, including nitrile gloves and safety glasses with side shields. 	3
	Man overboard	10	<ul style="list-style-type: none"> MOB procedures should be reviewed with the team every time the vessel is underway. The captain of the vessel is responsible for relating these procedures. Verify that the operator of the lead line is qualified and working in a safe manner. Use appropriate PPE, including PFD. 	4
ACTIVITY 7 – Collect surface water samples using 1) Gravity's PR2900 HVS system and 2) a secondary peristaltic pump system. Both use paired tubing lowered to desired depth.	Man overboard	10	<ul style="list-style-type: none"> MOB procedures should be reviewed with the team every time the vessel is underway. The captain of the vessel is responsible for relating these procedures. Verify that the operator of the tubing systems is qualified and working in a safe manner. Use appropriate PPE, including PFD. 	4
	Potential contaminant exposure	10	<ul style="list-style-type: none"> Maintain awareness of potential contaminant exposure and implement avoidance procedures. Use appropriate PPE, including nitrile gloves and safety glasses with side shields. 	3
ACTIVITY 8 – Sample processing: place filters in pre-labeled 8-ounce glass wide-mouth container with solids from PR2900 vortex separator (solids sample); cap and label XAD trap (dissolved phase sample). Place samples in Ziploc bags and store in cooler with ice. Unfiltered surface water samples will be transferred from the second pump system through tubing into a 20 liter glass carboy.	Potential contaminant exposure	10	<ul style="list-style-type: none"> Maintain awareness of potential contaminant exposure and implement avoidance procedures. Use appropriate PPE, including nitrile gloves and safety glasses with side shields. 	3
	Pinch tool hazards	8	<ul style="list-style-type: none"> When removing flat filters, solids, and XAD trap from the PR2900, open PR2900 fittings carefully. Use well-maintained and clean tools that are the correct size for the job. Do not force any fitting. 	4
ACTIVITY 9 – Move samples off vessel by hand once docked.	Lifting hazards/muscle strain/ergonomic hazards	6	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			<ul style="list-style-type: none"> Transfer equipment to people on boat rather than carrying equipment onto boat. 	
	Vessel offloading hazards	10	<ul style="list-style-type: none"> Follow vessel operator's instructions for leaving vessel. Maintain three points of contact when leaving vessel. Follow vessel operator's instructions for transferring equipment and samples off vessel. 	5
	Potential contaminant exposure	10	<ul style="list-style-type: none"> Use proper tools for decontamination. Wear appropriate PPE. Follow other Standard Operating Procedures (SOPs) for decontamination as specified in the Task Specific Field Sampling Plan. 	3
	Lifting hazards/muscle strain/ergonomic hazards	6	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. Transfer equipment to people on boat rather than carrying equipment onto boat. 	3
ACTIVITY 10 – Decontaminate equipment.	Lifting hazards/muscle strain	6	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3
	Potential contaminant exposure	10	<ul style="list-style-type: none"> Use proper tools for decontamination. Wear appropriate PPE Follow other Standard Operating Procedures (SOPs) for decontamination as specified in the Task Specific Field Sampling Plan. 	3
ACTIVITY 11 – Load/transport samples to warehouse for processing.	Lifting hazards/muscle strain	6	<ul style="list-style-type: none"> Practice proper lifting and manual handling of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. Wear abrasion gloves when moving equipment. No personnel should lift more than 40 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully. 	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
	Driving hazards	10	<ul style="list-style-type: none"> • All drivers must have current, valid driver's license on their person. • Complete pre-use visual inspection. Walk around the vehicle to inspect for potential hazards or mechanical issues before driving. • Practice defensive driving and drive in a courteous manner. All drivers must have taken the AECOM defensive driving course. • Seat belts must be worn by the driver and all passengers. • Drivers must not use cellular telephones or other communication devices such as two-way radios unless safely parked. • Window surfaces must be cleared of any materials such as ice, frost, mud, or water that can impair visibility. • Equip vehicles with first aid kit, fire extinguisher, flares or triangle, spare tire and jack, and cell phone. • Ensure all loads are properly secured. 	5

SPECIAL REQUIREMENTS

Step #	Equipment to be Used	Inspection Requirements	Training Requirements
	List equipment to be used in work activity	List inspection/permit requirements for work activity	List training requirements including hazard communication
1.	Research vessel	Perform boat inspection prior to use. Complete and submit float plan prior to use.	USCG-licensed vessel operator or equivalent. MOB recovery with limited assistance. First Aid/CPR Training. Approved boating safety course.
2.	PR2900 HVS system and secondary peristaltic pump system	Perform equipment inspection requirements per Field Sampling Plan prior to use.	Employees operating equipment shall be experienced or trained in the specific use of the equipment for the purpose of the sampling effort.
3.	<p>Emergency equipment provided by vessel operator (Gravity):</p> <ul style="list-style-type: none"> • GPS • Satellite phone (if cell phone service does not cover entire survey area) • VHF radios will remain on Channel 16 (for hailing/distress calls) at all times to listen for boat traffic, alerts, etc. unless actively keying/communicating on another channel with another party • Rescue rope in throw bag (commercially available) • Air horns and/or whistles • Waterproof flashlight • *Secondary "kicker" motor and *alternate means of propulsion (oars or paddles) • *Bailer (if bilge pump is not provided, bucket, or similar device should be on board) • *Duct tape • *Length of rope for securing boat on shore or alongside larger vessel • *Functional bilge pump/emergency pump • *Anchor with five to seven times as much line as the depth of water plus the distance from the surface of the water to where the anchor will attach to the bow • *Type 4 throwable ring or cushion • *Type BC fire extinguisher (10 pound) if extra fuel is carried in portable containers. <p>* Required minimum equipment to be provided by vessel provider (chartered boat); project Field Coordinator to ensure remaining equipment is carried on board.</p>	Inspect all equipment for battery life and integrity during the pre-trip boat inspection.	Personnel should be familiar with all emergency equipment.

4.	36T	36T	36T
5.	36T	36T	36T
6.	36T	36T	36T
7.	36T	36T	36T
8.	36T	36T	36T
9.	36T	36T	36T

INSTRUCTIONS AND RISK MATRIX

Hazard Evaluation – Identify principal steps of the task. Identify potential safety/health hazards for each step and determine initial risk rating using the matrix provided below. Identify control measures including PPE for each hazard. Re-evaluate hazard potential and assign a final risk rating. If the final risk rating is a 5-9 (medium risk) or 10-25 (high risk), additional hazard controls shall be identified and applied until the final risk rating is reduced to 4 or below. The final risk rating cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin. Add additional rows as required to cover all major steps/aspects of the activity.

Special Requirements – Identify equipment to be used including specific PPE required. Identify inspection requirements such as competent person, permit issue, documented task hazard analysis, etc. Identify training requirements such as hazard communication, scaffold user, fall protection, etc.

		High ←————→ Low				
High ↑ ↓ Low	Probability	Severity				
		5 - Catastrophic	4 - Critical	3 - Major	2 - Moderate	1 - Minor
	5 - Frequent	25	20	15	10	5
	4 - Probable	20	16	12	8	4
	3 - Occasional	15	12	9	6	3
	2 - Remote	10	8	6	4	2
	1 - Improbable	5	4	3	2	1
10-25 (red) are high risk, 5-9 (yellow) are medium risk, and 1-4 (green) are low risk						

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>\$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>\$250K to \$1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> \$10K to \$250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> \$1K to \$10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</\$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur during task/activity	1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000

Risk Rating (Probability x Severity)	Risk Acceptance Authority
1 to 4 (Low)	Risk is tolerable, manage at local level
5 to 9 (Medium)	Risk requires approval by Operations Lead/Supervisor & SH&E Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & SH&E Director

Attachment E

Daily Task Hazard Assessment/Daily Tailgate Forms

S3AM-209-FM6

Date:	Project Name / Location:		
Permit / Job Number:		Project Number:	
Description of Task:			

Do you have a pre-job hazard assessment (JHA) specific to this task in your hands?

- ☐ **Yes** – review the steps, hazards, and precautions. Attach and reference JHA in the form below. Add any additional steps, hazards, and precautions to this form otherwise unidentified on JHA.
- ☐ **No** – list all steps, hazards, and precautions associated with the task in the form below.

Basic Task Steps (explain in order how the task will be carried out)	Hazards (identify all hazards & potential hazards of each step)	Risk (before)	Control Measures / Precautions (describe how that hazard will be controlled)	Risk (after)	Revised? (yes – record time)
			Highest Risk Index		

The Task Hazard Assessment is to be completed at the worksite by the individual(s) who is intended to conduct the task immediately prior to initiating the associated task. Number and attach additional pages if necessary.

Originator

Print Name

Signature

Worker/Visitor acknowledgement and review of this content on back of this document. Originator to also sign Worker acknowledgement section.

Supervisor

Print Name _____

Signature

Risk Matrix on Reverse

THIS FORM IS TO BE KEPT ON JOB SITE.

WORKER SIGN ON

NAME (Please Print) TIME SIGNATURE

I participated in the development and understand the content of this Task Hazard Assessment.

Task Hazard Assessment Follow-Up/Review

Initials/Time Initials/Time Initials/Time

Instructions:

Identify basic steps of the task and associated hazards. Calculate the initial risk rating. Identify control measure to eliminate or reduce the hazard's risk and calculate the residual risk rating. If the risk rating (after controls are implemented) cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin.

Employees shall monitor the activities for compliance with this document. Workers should **STOP WORK** on a task if conditions change from the planned and agreed approach to the work.

This document should be updated to reflect new conditions or changes in task methods.

VISITOR SIGN ON

I have read and understand the content of this Task Hazard Assessment.

Emergency Meeting / Assembly Area

--

Emergency Contact

--

Method of Communication

--

Risk Rating Matrix

Probability	Severity				
	5 - Catastrophic	4 - Critical	3 - Major	2 - Moderate	1 - Minor
5 - Frequent	25	20	15	10	5
4 - Probable	20	16	12	8	4
3 - Occasional	16	12	9	6	3
2 - Remote	10	8	6	4	2
1 - Improbable	5	4	3	2	1

Risk Rating (Probability x Severity)	Risk Acceptance Authority
1 to 4 (Low)	Risk is tolerable, manage at local level
5 to 9 (Medium)	Risk requires approval by Operations Lead/Supervisor & SH&E Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & SH&E Director

Severity - Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>\$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>\$250K to \$1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> \$10K to \$250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> \$1K to \$10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	<=\$1K USD	Small chemical release contained onsite	Individual complaint
Probability				
Frequent	Expected to occur during task/activity			9/10
Probable	Likely to occur during task/activity			1/10
Occasional	May occur during the task/activity			1/100
Remote	Unlikely to occur during task/activity			1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity			1/10,000

Americas

Daily Tailgate Meeting

S3AM-209-FM5

Instructions: Conduct meeting prior to sending crews to individual tasks. Require attendance of all AECOM employees and subcontractors. Invite personnel from simultaneous operations for coordination purposes. Review scope of work and briefly discuss required and applicable topics. **This meeting is a daily refresher, not a full orientation.** Task-specific discussions associated with Task Hazard Assessment (THA) follow this meeting at the task location immediately before individual task is started.

AECOM Supervisor Name:

Phone Number:

AECOM SH&E Rep. Name:

Phone Number:

Meeting Leader:

Date:		Project Name/Location:		Project Number:	
Today's Scope of Work:					
Muster Point Location:		First Aid Kit Location:		Fire Extinguisher Location:	
1. Required Topics			2. Discuss if Applicable to Today's Work		
<input type="checkbox"/> Fitness for Duty requirements, all sign in / sign out <input type="checkbox"/> Required training (incl. task specific) completed and current <input type="checkbox"/> SH&E Plan onsite - understood, reviewed, signed by all (incl. scope, hazards, controls, procedures, requirements, etc.) <input type="checkbox"/> Pre-Job Hazard Assessments (JHA/JSAs) available and understood <input type="checkbox"/> Task Hazard Assessments (THAs) are to be completed for each task immediately prior to conducting <input type="checkbox"/> STOP WORK Right & Responsibility- all task changes/changed conditions re-assess with THA <input type="checkbox"/> Requirement to report to supervisor any injury, illness, damage, near miss, unsafe act / condition <input type="checkbox"/> Emergency Response Plan – including muster point, first aid kit, fire extinguisher, clinic/hospital location <input type="checkbox"/> Personal Protective Equipment (PPE) - Required items per hazard assessments in good condition / in use by all <input type="checkbox"/> Equipment/machinery inspected (documented as required) and in good condition - operators properly trained/certified <input type="checkbox"/> Work area set up and demarcation/ barricades in place to protect workers, site staff, and the public <input type="checkbox"/> Required checklists/records available, understood (describe): <input type="checkbox"/> Lessons Learned / SH&E improvements (describe):			<input checked="" type="checkbox"/> <input type="checkbox"/> Check <input checked="" type="checkbox"/> as reviewed or mark <input type="checkbox"/> as not applicable <input type="checkbox"/> Biological/ Chemical / Electrical Hazards <input type="checkbox"/> Ergonomics - Lifting, Body Position <input type="checkbox"/> Lock Out/ Tag Out Short Service Employees - visual identifier and mentor/ oversight assignment <input type="checkbox"/> Simultaneous/ Neighbouring Operations <input type="checkbox"/> Slip/ Trip/ Fall Hazards <input type="checkbox"/> Specialized PPE Needs <input type="checkbox"/> Traffic Control <input type="checkbox"/> Waste Management/ Decontamination <input type="checkbox"/> Weather Hazards / Heat Stress / Cold Stress <input type="checkbox"/> Subcontractor Requirements (e.g., JHAs, THAs, procedures, reporting, etc.) <input type="checkbox"/> Work Permits / Plans required (e.g., Fall Protection, Confined Space, Hot Work, Critical Lifts, etc.); in place, understood (identify/attach): <input type="checkbox"/> Other Topics (describe/attach): <input type="checkbox"/> Client specific requirements (describe):		
3. Daily Check Out by Site Supervisor					
Describe incidents, near misses, observations or Stop Work interventions from today:			Describe Lessons Learned/ Improvement Areas from today:		
<i>The site is being left in a safe condition and work crew checked out as fit unless otherwise specified as above.</i>					
Site Supervisor Name		Signature		Date	
				Time (at end of day / shift)	

Worker Acknowledgement / Sign In Sign Out sheets applicable to this meeting are on reverse and, if applicable, attached.

Daily Tailgate Meeting (S3AM-209-FM5)

Revision 7 December 27, 2017

PRINTED COPIES ARE UNCONTROLLED. CONTROLLED COPY IS AVAILABLE ON COMPANY INTRANET.

All employees:

- **STOP WORK** if concerned / uncertain about safety / hazard or additional precaution is not recorded on the THA.
- **Be alert and communicate any changes in personnel or conditions at the worksite to the supervisor.**
- **Reassess task, hazards, & mitigations on an ongoing basis; amend the THA if needed.**

SITE WORKERS (including AECOM Contractors and Subcontractors): Your signature below means that you understand:

- * The requirement to participate in creating, reviewing, & updating hazard assessments (THA) applicable to your task(s).
- * The hazards & control measures associated with each task you are about to perform.
- * The permit to work requirements applicable to the work you are about to perform (if it includes permitted activities).
- * That no tasks or work is to be performed without a hazard assessment.
- * Your authority & obligation to "Stop Work" intervene, speak up/ listen up.

Your initials (right columns) certify that you arrived & departed fit for duty, & have reported all incidents/near misses; meaning:

- * You are physically and mentally fit for duty and have inspected your required PPE to ensure satisfactory condition.
- * You are not under the influence of any type of medication, drugs, or alcohol that could affect your ability to work safely.
- * You are aware of your responsibility to immediately report any illness, injury (regardless of where or when it occurred), or impairment/fatigue issue to the AECOM Supervisor.
- * You signed out as fit / uninjured unless you have otherwise informed the AECOM Supervisor.

Print Name & Company	Signature	Initials & Sign In Time	Initials & Sign Out Time
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit

(Attach additional Site Worker sign-in/out sheets if needed) Identify number of attached sheets: _____

SITE VISITOR / SITE REPRESENTATIVE

Name	Company Name	Arrival Time	Departure Time	Signature

Attachment F

AED Program

AED Program

1.1. Automated External Defibrillator (AED)

1.1.1. AED Coordinator, Nicky Moody

- Participate in case reviews, responder training and retraining, data collection, and other quality assurance activities.
- Assure maintenance and inspection of AEDs and related response equipment.
- Maintain a list of trained early defibrillation responders.
- Ensure compliance with the policies and procedures of the AED Program.

1.1.2. Medical Supervisor

Refer to documentation that accompanies AED.

1.1.3. Location of AED

The AEDs will be located in the following areas:

1. On all vessels within the wheelhouse, next to the first aid kit – orientation will be provided during tailgate safety meetings. A figure of the AED locations is provided in the HASP addendums for each study.
2. In Processing Laboratory, adjacent to first aid kit – orientation will be provided during tailgate safety meetings. A figure of the AED locations is provided in the HASP addendums for each study.

1.1.4. Notification of Emergency Services

Notification of Emergency Service procedures are described in Section 12.0 of the HASP.

1.1.5. Training and Orientation

Employees will have First Aid/CPR+AED training. After the AED's arrive on-site (i.e., at vessels and processing laboratories), the team will receive an initial AED orientation. Thereafter, during the daily tailgate meetings and prior to the event, the following AED-related items will be reviewed:

1. Location where the AED and first aid kits will be located.
2. The contents of the AED and first aid kit.
3. Methodology on how the AED is to be used in an emergency situation.

1.1.6. Procedures for AED Use

The AED Instructions will be added to the HASP as an attachment after the AEDs have been procured. Orientation of the AEDs will be incorporated into every tailgate SH&E Meeting.

1.1.7. Procedures for Maintenance

1.1.7.1. Monthly Inspection

A monthly inspection of the AED will be performed by Nicky Moody or her designee. Inspection will be consistent with the manufacturer's requirements, as well as requirements described in 3NA_FM012_First Aid Kit_AED_Inspection.

1.1.7.2. Annual Maintenance

Annual maintenance is performed by the rental vendor. During the annual inspection, pads, batteries and first aid supplies are checked for expiration dates and functionality.

Attachments:

- **List of AED-Trained employees**
- **Monthly Inspection Form**
- **AED Instructions**

List of AED-Trained Employees. Additional names will be added to the list as appropriate.

Name of AED Trained Personnel	Organization
Mark Tauscher	AECOM
Nicky Moody	AECOM
Michaela McCoog	AECOM
Jon L. Dasler, PE, PLS, CH	DEA Principal-In-Charge
Jason M. Dorfman	DEA Hydrographer/ Designated FSM
Gregory, P. Baird, PLS, CH	DEA Project Surveyor
John M. Staly	DEA Senior Hydrographer/Operator
David T. Moehl, PLS, CH	DEA Senior Hydrographer/Operator
USCG 100-Ton Master	Captain while carrying passengers
Daniel M. Prince	DEA Hydrographer/Vessel Operator

Americas

First Aid Kit / AED Inventory & Inspection

S3AM-012-FM1

This form is used to record the required contents of the first aid kit as well as document monthly or weekly First Aid Kit / AED inspections. The column 'Qty' (quantity) is to be completed according to jurisdictional requirements and/or approval prior to the first aid kit being delivered to its intended location and at the beginning of each calendar year thereafter. Any listed items that are not required by the given jurisdiction or approved to be included in the first aid kit shall have 'N/A' entered in the corresponding 'Qty' box. If an AED is not on location, or inspection is included on another S3AM-012-FM1 First Aid Kit / AED Inventory & Inspection form, mark the AED content in this form with 'N/A'.

Project/Location/ Office Name:		Address:	
First Aid Kit Type:		Kit Location:	
First Aid Kit ID #:		AED Location:	
AED ID #:		Date:	

Monthly inspections require the inspector to record the actual quantity of required items in the corresponding monthly column. Items deficient in number must be restocked. Unapproved items shall be removed from the First Aid Kit.

Weekly inspection requires the inspector to place a '✓' as quantity satisfactory or an 'x' as deficient in one of the four weekly cells for the given month. Inspector will note replacements and date in the comment section.

Item (Year)	Qty	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
First Aid Manual (current)													
Adhesive Bandage													
Elastic Adhesive Bandage													
Gauze Roller Bandage													
Triangular Bandage													
Conforming Bandage													
Tensor Bandage													
Safety Pins													
Adhesive Tape													
Adhesive Bandage													
Antiseptic (solution/swabs)													
Burn Treatment													
Medical Exam Gloves													
Dressing (Sterile Pad) Sz/ Type													
Dressing (Sterile Pad) Sz/ Type													
Dressing (Sterile Pad) Sz/ Type													
Dressing (Sterile Pad) Sz/ Type													
Dressing (self-adherent roller)													
Eye Pad (with Shield/Tape)													

Item (Year)	Qty	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Breathing Barrier <i>(CPR use)</i>													
Bandage Scissors													
Soap													
Cold Compress													
Splinter Forceps													
Waterless Hand Cleaner													
Waterproof Waste Bag													
Eye Wash													
Tweezers													

AED inspected according to manufacturer specifications. Use '✓' as acceptable condition and 'x' as deficient. Deficiencies, corrective actions taken, and whether inspection was an 'After-Use' inspection recorded in monthly comments below.

AED Condition													
AED Tested													
AED Pads													
AED Battery													
AED Supplies <i>(razor, manual)</i>													
AED Other													

Inspector(s) shall record his/her name, record any comments regarding the inspection (including items replaced) and initial once complete.

MONTH	Inspector Name	Comments	Initials
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			

This page will be replaced with the AED Instructions once the specific AED model is known for the project.

Attachment G

Benzene and Vinyl Chloride Action Level Calculations

Appendix G – Support of Benzene and Vinyl Chloride Action Levels

Benzene Action Level

OSHA PEL - General Industry 1910.1028

1 ppm TWA – 8 hour Time Weighted Average (TWA)

5 ppm STEL - 15 mins

ACGIH TLV® (1996)

0.5 ppm (1.6 mg/m³) TWA

2.5 ppm (8 mg/m³) STEL

- 1) Worst-case scenario, low-end of range: 5 ppm PID Units detects 100% Benzene

Manufacturer's Conversion Factor for Rae Systems 10.6 eV Lamp: 0.47*

http://www.raesystems.com/sites/default/files/content/resources/Technical-Note-106_A-Guideline-for-Pid-Instrument-Response_0.pdf

5 ppm PID Units x 0.47 Conversion Factor = 2.35 ppm Benzene

$[(2.35 \text{ ppm Benzene} \times 5 \text{ minutes}) + (0 \text{ ppm Benzene} \times 475 \text{ mins})] / 480 \text{ min} =$

$11.75 + 0 / 480 = \mathbf{0.024 \text{ ppm Benzene 8hr TWA}}$

- 2) Worst-case scenario, high-end of range: 25 ppm PID Units detects 100% Benzene

Manufacturer's Conversion Factor for Rae Systems 10.6 eV Lamp: 0.47

http://www.raesystems.com/sites/default/files/content/resources/Technical-Note-106_A-Guideline-for-Pid-Instrument-Response_0.pdf

25ppm PID Units x 0.47 Conversion Factor = 11.75 ppm Benzene

$[(11.75 \text{ ppm Benzene} \times 5 \text{ minutes}) + (0 \text{ ppm Benzene} \times 10 \text{ mins})] / 15 \text{ min} =$

$58.75 + 0 / 15 = \mathbf{3.92 \text{ ppm Benzene 15 mins TWA}}$

Vinyl Chloride Action Level

OSHA PEL - General Industry 1910.1017

1 ppm TWA – 8 hour Time Weighted Average (TWA)

0.5 ppm TWA – Action Level

No STEL Identified

ACGIH TLV® (2017)

1 ppm (2.56 mg/m³) TWA

No STEL Identified

- 1) Worst case scenario, low-end of range: 5 ppm PID Units detects 100% Vinyl Chloride

Manufacturer's Conversion Factor for Rae Systems 10.6 eV Lamp: 2.0

http://www.raesystems.com/sites/default/files/content/resources/Technical-Note-106_A-Guideline-for-Pid-Instrument-Response_0.pdf

5 ppm PID Units x 2.0 Conversion Factor = 10 ppm Vinyl Chloride

$[(10 \text{ ppm Vinyl Chloride} \times 5 \text{ minutes}) + (0 \text{ ppm Vinyl Chloride} \times 475 \text{ mins})] / 480 \text{ min} =$

$50 + 0 / 480 = \mathbf{0.10 \text{ ppm Vinyl Chloride 8hr TWA}}$

- 2) Worst case scenario, high-end of range: 25 ppm PID Units detects 100% Vinyl Chloride

Manufacturer's Conversion Factor for Rae Systems 10.6 eV Lamp: 2.0

http://www.raesystems.com/sites/default/files/content/resources/Technical-Note-106_A-Guideline-for-Pid-Instrument-Response_0.pdf

25 ppm PID Units x 2.0 Conversion Factor = 50 ppm Vinyl Chloride

$[(50 \text{ ppm Vinyl Chloride} \times 5 \text{ minutes}) + (0 \text{ ppm Vinyl Chloride} \times 475 \text{ mins})] / 480 \text{ min} =$

$250 + 0 / 480 = \mathbf{0.52 \text{ ppm Vinyl Chloride 8hr TWA}}$

Definitions:

eV = electron volts

Hr = hour

mg/m³ = milligrams per cubic meter

OSHA = Occupational Safety and Health Administration

PEL = Permissible Exposure Limit

PID = photoionization Detector

ppm = parts per million

STEL = Short Term Exposure Limit

TLV = Threshold Limit Value

TWA = Time Weighted Average

